RCS 06-475

EGLIN AIR FORCE BASE,
Florida

LONG-TERM VEGETATION CONTROL FOR EGLIN AIR FORCE BASE, FLORIDA

FINAL ENVIRONMENTAL ASSESSMENT

JULY 2008

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JUL 2008		**00-00-2008 to 00-00-2008**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Final Environmental Assessment for Long-Term Vegetation Control for Eglin Air Force Base, Florida	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Science Applications International Corporation,1140 Eglin Parkway,Shalimar,FL,32579**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**270**	

REVISED FINDING OF NO SIGNIFICANT IMPACT
FOR
ENVIRONMENTAL ASSESSMENT FOR LONG-TERM VEGETATION CONTROL
FOR
EGLIN AIR FORCE BASE, FLORIDA

RCS 06-475

Introduction

This finding and the analysis upon which it is based were prepared pursuant to the President's Council on Environmental Quality regulations for implementing the procedural provisions of the National Environmental Policy Act as put into effect by 40 Code of Federal Regulations (CFR) 1500-1508 and the U.S. Air Force *Environmental Impact Analysis Process* as effectuated by 32 CFR Part 989. The Air Force has conducted an Environmental Assessment (EA) of the probable environmental consequences for Long-Term Vegetation Control on Eglin Air Force Base (AFB), Florida.

Purpose and Need (EA Section 1.1 and 1.2, pages 1-1 to 1-5)

The principal purpose of maintaining the habitats at Eglin AFB is to support military testing and training. Due to the varied needs of Eglin missions, a variety of habitats are necessary, ranging from dense forests to cleared ranges. To better maintain the spectrum of habitats, the Air Force proposes to reduce and/or phase out current mechanical vegetation management practices (mowing, roller drum chopping, chainsaws, hand-held saws) and allow for chemical vegetation management in areas where mechanical means are not possible or desirable. Program implementation would reduce vegetation control operation costs, erosion and stream sedimentation, and impacts to sensitive species and habitat associated with land test areas. Also, the Proposed Action would provide Eglin AFB natural resource managers with flexible vegetation management tools for sensitive species habitat improvement, particularly restoration of longleaf pine savannas for species such as the red-cockaded woodpecker (RCW). Other portions of the reservation would be maintained in habitat conditions as required by the military mission.

Description of Proposed Action and Alternatives

Proposed Action (EA Section 2.1, page 2-1 to 2-14). Eglin proposes an increase in the use of herbicides and prescribed fire to manage vegetation on test areas and interstitial areas, restore RCW and native ecosystems, control invasive non-native plant species (INPS), and develop a native plant nursery while concurrently decreasing the use of mechanical control methods (mowers, bush-hogs, chainsaws, hand-held saws). Herbicide treatments would continue on an as-needed basis to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance. Aerial application of herbicides is proposed for certain areas on Eglin AFB. The 46th Test Wing and Civil Engineering group at Eglin AFB are the primary user groups interested in transitioning from current controls to chemical vegetation management.

The Proposed Action includes promotion of native groundcover species through use of directed application methods. The Proposed Action includes implementing standard avoidance and minimization measures for sensitive habitat and species protection; spill prevention, cleanup, and containment; adherence to herbicide labels and instructions during handling, mixing, and application of herbicides; and health and safety precautions. Expanded herbicide use is proposed for the Eglin mainland reservation.

Herbicides Proposed for Use at Eglin AFB under the Proposed Action

Herbicide	Trade Names
Aminopyralid	Milestone™
Fluroxypyr	Vista®
Fosamine	Krenite®
Glyphosate	Accord® XRT
	Rodeo® (aquatic)
Imazapic	Plateau®
Imazapyr	Arsenal®
	Chopper®
	Habitat® (aquatic)
Metsulfuron	Escort®
Sulfometuron methyl	Oust® XP
Triclopyr	Garlon® 3a
	Garlon 4 Ultra
	Renovate® 3 (aquatic)

Herbicide applicators conducting herbicide treatment activities on Eglin AFB would be Department of Defense (DoD) - or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator. An Eglin AFB endangered species biologist would manage and oversee herbicide contracts for the control of non-native species. Prior to each herbicide application in endangered species habitat, applicators (including contractors and their staff) would be briefed on any potential endangered species concerns; alternatively, contract clauses will require endangered species coordination. Herbicide labels and instructions would be adhered to during handling, mixing, and application of herbicides.

Alternative Action (EA Section 2.21, page 2-14 to 2-15). Under Alternative 1, minimum vegetation management would be accomplished for test area maintenance and habitat management for threatened and endangered (T&E) species. The number of acres treated, intensity, and frequency of treatments would be reduced from the preferred alternative. All of the herbicides labeled for aquatic used for the preferred alternative would be eliminated. Alternative 1 would allow an increased use above current levels of a variety of herbicides on sandhills habitat, but would continue to restrict the use of chemicals near aquatic habitats such as streams, wetlands, and ponds. Without aquatic-labeled chemicals, Eglin would not be able to treat many portions of test areas and interstitial areas.

The No Action Alternative (EA Section 2.2.2, page 2-15). Under the No Action Alternative, mowing and bush hogging/roller-drum chopping would continue on an estimated 27,000 acres of test area lands every two years. Vegetation growth would continue to obstruct some line-of-sight (LOS), new areas would be obstructed, and it would not be possible to conduct certain testing that requires cleared areas. The Natural Resources Section (NRS) would continue to use hexazinone in sandhills for RCW and ecosystem restoration, but it would not be possible to use it in other habitat types. Erosion from drum-chopped areas would continue to be an issue.

Alternative Considered But Not Carried Forward (EA Section 2.3, page 2-15 to 2-16). The Air Force examined several alternatives to the Proposed Action. Alternatives that met minimum criteria were considered suitable for detailed analysis. The selection criteria were: 1) conformance to existing laws and Air Force policy, the Eglin AFB Integrated Natural Resources Management Plan and the Pest

Management Plan for Eglin AFB; 2) techniques that provided adequate control of unwanted vegetation; 3) techniques that were fiscally acceptable from a socioeconomic standpoint; and, 4) techniques that minimize downtime (i.e., times military training cannot be conducted) on the test areas, and prescriptions that maximize mission-attainment of the test ranges, and techniques that maximize the windows of opportunity for treatment during the course of the year.

Use of only mechanical, prescribed fire and ground application of herbicides was considered but not carried forward as an alternative. Unexploded Ordnance (UXO) limits the use of ground equipment at several test areas. Control of undesirable vegetation using only mechanical or ground application of herbicides and burning is more costly than aerial application. Aerial application of herbicides is often the only method available for large area control of undesirable vegetation when the window of opportunity for application is small; it is the only method that can be used when the area is unmanageable by ground control techniques.

Affected Environment (EA Section 3, page 3-1 to 3-36)

The Proposed Action would potentially affect soils, socioeconomic factors, water resources, biological resources, environmental justice/risk to children, safety, and air quality.

Environmental Impacts (EA Section 4, page 4-1 to 4-27)

Section 4 of the EA discusses in detail potential environmental impact to the following resources.

Soils. The Proposed Action and Alternative are not expected to have adverse impacts to soils. The replacement of the current roller drum/chopping method through the use of aerial dispersed targeted chemical herbicides may alleviate erosion potential caused by mechanical methods.

Water Resources. Under the Proposed Action, no significant impacts to water resources are expected. The use of a 300-foot buffer zone around surface waters, wetlands, and floodplains (unless using an herbicide labeled for water use) and avoidance of shallow (10 feet below surface) groundwater locations would be employed in the application of listed herbicides. The alternative action would remove the use of aquatic herbicides from the suite of herbicides under the proposed action.

Air Quality. Adverse impacts to regional air quality are not expected from the application of the proposed herbicides and the prescribed burning of herbicide-treated land. Aerial herbicide applications would have a very short-term localized impact as a result of drift. In adverse conditions, most drift would settle within 100 to 200 feet of the release point. In addition, prescribed burns occurring a year or more following herbicide treatment are not expected to increase air emissions.

Biological Resources. Under the Proposed Action and Alternative, the Air Force does not expect negative impacts to species or habitats if recommended practices are followed in the use and dispersal of the chemicals discussed in the EA. NRS has determined that the application of herbicides for long-term vegetation control on Eglin is not likely to adversely affect sensitive avian, mammalian, amphibious, reptilian, piscine species, sensitive plant species, or sensitive habitat.

Positive impacts are expected over time because the Proposed Action would improve habitat quality and biodiversity. Being able to treat a large number of infested acres would greatly improve the probability of controlling many of the INPS currently found on Eglin AFB.

Socioeconomic Resources. The Proposed Action and Alternative are not expected to have adverse impacts to socioeconomic factors. There would be a decrease in the amount of mechanical vegetation control measures such as bush hogging and roller-drum chopping. This would reduce the demand for these operators. However, it is expected that these workers would be employed performing other range maintenance activities, further enhancing the ecological and monetary value of Eglin AFB.

Recreation areas may be affected on a short-term basis if herbicides were to be applied in or around these areas and temporary closures are required to protect public safety. If specific times of high usage such as various hunting seasons are taken into application planning, no negative impacts are expected. Long-term impacts to public usage within these areas are also not expected from the Proposed Action.

Environmental Justice and Risk to Children. If application guidelines regarding these herbicides (i.e., label instructions and management practices) are followed, and the herbicides are applied by licensed, trained and permitted pilots, no impacts are expected. It is not expected that children or minority or low-income populations would be affected disproportionately by the Proposed Action or Alternative.

Safety. No safety impacts are anticipated under the Proposed Action or Alternative. Application methods would include aerial and various ground application and spot-treatment techniques. Only certified herbicide applicators would be authorized to handle and apply herbicides on Eglin AFB.

Issues Eliminated from Detailed Analysis (EA Section 1.5.1, page 1-7 to 1-8)

Based on the scope of the Proposed Action, Alternative 1, and the No Action Alternative and a preliminary analysis, the following issues were eliminated from further analysis: Cultural Resources, Land Use, and Noise. Therefore, these issues were not carried forward for further analysis.

Eglin does not expect any negative impacts to Cultural Resources as a result of the Proposed Action or Alternative. Additionally, decreasing the frequency of ground disturbing activities (by bush hogging and roller-drum chopping) would serve to protect surface and subsurface resources. Therefore, the Air Force excluded Cultural Resources from any further analysis.

Noise associated with the Proposed Action would result from the aerial dispersal of herbicides from a helicopter and/or a fixed-wing airplane. Noise from ground application of herbicides would be from motorized vehicles such as trucks, trackers, all-terrain vehicles (ATVs), and skidders. The use of a helicopter or fixed-wing airplane, and various motorized vehicles a few times per year would not significantly contribute to the current noise environment of Eglin AFB. In addition, the actions would take place on remote test ranges and locations on Eglin AFB already subject to elevated levels of noise production. Eglin does not anticipate noise impacts to the public from herbicide application.

There would be no effects to land use. Application of the proposed herbicides would occur in new areas but would not change the land use. No change to surrounding land use or to current Air Installation Compatibility Use Zones (AICUZ) would occur.

Cumulative Impacts Analysis (EA Section 5.2, page 5-2 to 5-3)

The Proposed Action and alternative action would not create cumulative environmental or health impacts. No present or reasonably foreseeable future actions would have a cumulative impact on soils. The current use of hexazinone as a herbicide on Eglin carries the same cumulative risk as the Proposed Action and Alternative 1. Potential cumulative impacts may occur to soils if repeated applications occur prior to the complete decomposition of previous applications. In areas where repeated applications of herbicides

during a one-year span may be necessary, care must be taken to recognize potential buildup of periodically persistent chemicals on a case-by-case basis.

Routine monitoring for contaminants in groundwater by Eglin's compliance section, as well as maintaining buffer zones around surface waters, wetlands, and floodplains, would ensure that no adverse cumulative impacts to water resources are from vegetation maintenance occurring on Eglin from past, present, or future activities.

The increased use of herbicides would also increase the potential for herbicide drift off target and the potential for releases to the air during prescribed burns following treatment. Currently, the levels of emissions from hexazinone are minimal, and the additions of the herbicides in the Proposed Action are not expected to increase impacts to regional air quality.

No additive and overlapping impacts associated with biological resources by implementing the proposed actions would have a cumulative impact on biological resources. Potential cumulative impacts may occur to biological resources (amphibians are of particular concern) if repeated applications occur prior to the complete decomposition of previous applications. Applications of herbicides would follow United States Environmental Protection Agency (USEPA) labels. This risk of cumulative impacts to biological resources should be mitigated by avoidance and minimization measures.

No present or reasonably foreseeable future actions would have a cumulative impact on socioeconomic resources. It is expected that the usage of these chemicals would not result in a net loss of economic activity on Base as many of the personnel who currently hold jobs dealing with mechanical vegetation removal would be reassigned other duties on Base. No present or reasonably foreseeable future actions would have a cumulative impact on environmental justice. If current procedures and additional public notification actions are used on areas open to the general public for recreation, no adverse cumulative impacts to environmental justice resulting from these activities would be expected.

No present or reasonably foreseeable future actions would have a cumulative impact on safety. If current procedures and additional public notification actions are used on areas open to the general public for recreation, no adverse cumulative impacts to safety from past, present, or future activities of vegetation maintenance occurring on Eglin would be expected.

Public Notice

Public Comment (will be located in EA Appendix E). The Draft EA for Long-Term Vegetation Control at Eglin Air Force Base (AFB), Florida and the Finding of No Significant Impact were available for public review and comment at the Crestview Public Library, 1445 Commerce Drive, Crestview, FL; the Fort Walton Beach Public Library, 185 SE Miracle Strip Parkway, Fort Walton Beach, Florida; and the Niceville Library, 206 Partin Drive, Niceville, Florida. Copies were available for public review and comment from 27 March 2007 through 10 April 2007.

Permits (EA Section 6.2, page 6-1)

The following permits are required, if applicable.

1. Coastal Zone Management Act Determination
2. Endangered Species Act (ESA) Section 7 Consultation with the United States Fish and Wildlife Service (USFWS)

MANAGEMENT ACTIONS (EA SECTION 6.3, PAGE 6-1 TO 6-3)

Water Resources

- Establish appropriate Special Management Zone (SMZ) along perennial and intermittent streams and flowing bodies of water.
- Conduct on-site pesticide handling away from streams, ponds, wells, and roadside ditches, such as tank mixing, loading, and rinsing equipment.
- Where available, check reports of depth to groundwater and avoid application of herbicides to test areas having shallow (10 feet below surface) groundwater.
- Evaluate weather conditions (e.g., temperature, wind speed, and precipitation), equipment capabilities, and pesticide formulations to avoid pesticide drift into the SMZ.
- Herbicide labels and instructions would be adhered to during handling, mixing, and application.
- All herbicide applicators conducting treatment activities on Eglin AFB would be DoD or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator.
- Employ a general 300-ft buffer zone around surface waters, wetlands, and floodplains (unless using an herbicide labeled for water use), or determine the soil erodibility, slope, and surface water width of a particular area and use that information along with the Florida State Division of Forestry Silviculture Best Management Practices Handbook to create a smaller buffer zone (minimum 35 feet) as appropriate in areas with lower soil erodibility and slope—only if the buffer is not already pre-determined by a sensitive species or habitat.

Air Quality

- To decrease potential for drift, aerial application of herbicides would not occur when wind speeds are greater than 10 miles per hour.

Biological Resources

- Any treatments in Outstanding Natural Areas, Significant Botanical Sites, or High Quality Natural Communities or near aquatic preserves, Gulf sturgeon critical habitat, or essential fish habitat would require approval from the Eglin Forest Management NRS, including specifics on application method, herbicide type, buffers, and timing.
- Sensitive habitats would be digitized with GPS/GIS and provided to aerial herbicide applicators for avoidance, unless specifically approved by the Eglin Forest Management NRS.
- Restrict aerial application of non-aquatic-labeled pesticides near aquatic sensitive habitats.
- Time the application of herbicides to avoid upcoming rain events with selection of less problematic herbicides (if rainfall is probable), use of buffer zones, as well as use of weather forecasts. Eglin obtains information from the National Weather Service including spot forecasts.
- Herbicide labels and instructions would be adhered to during handling, mixing, and application of herbicides including USEPA suggested mitigations.
- Herbicide applicators conducting herbicide treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator.
- During the planning process, Eglin would consider the objectives of the proposed activity and potential impacts actions that disturb the soil surface or impact water quality.
- Planners would help identify sensitive areas and applicable best management practices (BMPs) to be used during herbicide applications.

- Herbicide treatments would continue on an as-needed basis to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance.
- Applicators (including contractors and their staff) would be briefed on any potential endangered species concerns and applicable avoidance and minimization measures before conducting each herbicide application in endangered species habitat.
- Herbicide applications would not occur within 1500 feet of ponds and sampling points located within Florida Natural Areas Inventory (FNAI) Category 1 (habitat known to support flatwoods salamanders) or FNAI Category 2 (habitat with a strong potential to support flatwoods salamanders) areas. The NRS would provide maps showing these areas to applicators.
- Applications of herbicides would not occur within 300 feet of known gopher frog habitat or known Florida bog frog habitat.
- A 300-foot buffer would be required for non-aquatic-labeled herbicides which are toxic to fish and/or herbicides which are highly mobile and have the potential to contaminate groundwater around designated Gulf sturgeon critical habitat and Okaloosa darter streams.
- Direct application of herbicides to water would be prohibited around designated Gulf sturgeon critical habitat and in Okaloosa darter streams.
- Herbicide applications would not occur within 1500 feet of the bald eagle nest site during the breeding season (1 October through 15 May).
- In the event of ground application of herbicides within an RCW cluster using mechanized equipment, operations would not occur during the RCW nesting season.
- In the event of manual application of herbicides within an RCW cluster, procedures outlined in the consultation for "Hexazinone Application on Interstitial Areas" (25 September 2001) would be followed or further coordination with the USFWS would take place.
- Aerial applications of herbicides that are known to cause eye damage would be prohibited—only ground applications of these herbicides would be permitted.

Environmental Justice and Risks to Children

- Proper planning of herbicide application missions would be planned to prevent the release of approved chemicals near populated areas.
- As per safety protocols listed in Sections 6.3.3 and 6.3.5, areas on Eglin used for recreational purposes (hunting, fishing, camping, etc.) would be closed prior to application of herbicides and until applied herbicides have degraded to safe levels (dependant on labeled chemical persistence).

Safety

- Herbicide labels and instructions would be adhered to during handling, mixing, and application.
- All herbicide applicators conducting treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator.
- For areas used by recreationists or other persons, post signs at the entrances of areas to be treated containing the reason, time, and duration of closure.
- Schedule herbicide application so that herbicides minimize impacts to hunting.
- Dispose of or recycle pesticide containers and/or excess pesticides according to local, state, and federal regulations and label requirements.
- Clean up and/or contain any pesticide spill immediately.

FINDING OF NO SIGNIFICANT IMPACT

Based on my review of the facts and the environmental analysis contained in the attached EA and as summarized above, I find the proposed decision of the Air Force to implement long-term vegetation control at Eglin AFB would not have a significant impact on the human or natural environment; therefore, an environmental impact statement is not required. This analysis fulfills the requirements of the National Environmental Policy Act, the President's Council on Environmental Quality, and 32 CFR Part 989.

Signature

DENNIS D. YATES, Colonel, USAF
Commander, 96th Civil Engineer Group

8 SEP 08
Date

RCS 06-475

LONG-TERM VEGETATION CONTROL FOR EGLIN AIR FORCE BASE, FLORIDA

FINAL ENVIRONMENTAL ASSESSMENT

SUBMITTED TO:

96th Civil Engineer Group
Environmental Management Division
96 CEG/CEV
Eglin AFB, FL 32542

JULY 2008

PRINTED ON RECYCLED PAPER

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

%	Percent
96 CEG/CEVH	96th Civil Engineering Group, Environmental Management Division, Cultural Resources Branch
96 CEG/CEVSP	96th Civil Engineer Group/Environmental Management Division, Stewardship Branch, Environmental Analysis Section
96 CES/CEOUE	96th Civil Engineer Squadron, Pest Management
96 CEG/CEVCE	96th Civil Engineer Squadron, Environmental Engineering Section
ACC	Air Combat Command
ACC/SE	Air Combat Command Safety Office
AFB	Air Force Base
AFI	Air Force Instruction
AFOSH	Air Force Occupational and Environmental Safety, Fire Protection and Health
AICUZ	Air Installation Compatibility Use Zones
ATV	All-terrain Vehicle
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CCCL	Coastal Construction Control Line
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	Centimeter
CO	Carbon Monoxide
CWA	Clean Water Act
CY	Calendar Year
CZMA	Coastal Zone Management Act
DoD	Department of Defense
DOH	Department of Health
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordnance Disposal
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAC	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FNAI	Florida Natural Areas Inventory
ft	Feet/Foot
ft^2	Square Feet
GIS	Geographic Information System
GPS	Global Positioning System
HAP	Hazardous Air Pollutants
HLZ	Helicopter Landing Zone
HQNC	High Quality Natural Community
HWM	High Water Mark
IAW	In Accordance With
INPS	Invasive Non-native Plant Species
kg	Kilogram
L	Liter
lb	Pound
LC	Lethal Concentration
LC_{50}	Median Lethal Concentration
LD	Lethal Dose

LD_{50}	Median Lethal Dose
LOS	Line-of-Sight
LTM	Long-Term Monitoring
LUC	Land Use Control
m	Meter
µg/m³	Micrograms per Cubic Meter
mg	Milligram
mm	Millimeter
Mph	Miles per Hour
MSDS	Material Safety Data Sheets
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_x	Nitrogen Oxides
NRS	Natural Resources Section
ODS	Ozone Depleting Substances
ONA	Outstanding Natural Area
ORM	Operational Risk Management
OSHA	Occupational Safety and Health Act
Pb	Lead
pH	A measure of acidity
POI	Point Of Interest
PM_{10}	Particulate Matter $\leq$ 10 microns
ppb	Parts per Billion
ppm	Parts per Million
ppt	Parts per Thousand
PTO	Power Take Off
RCRA	Resource Conservation and Recovery Act
RCW	Red-cockaded Woodpecker
ROCC	Range Operations and Control Center
ROI	Region of Influence
SARA	Superfund Reauthorization Act
SBS	Significant Botanical Site
SEAS	Shellfish Environmental Assessment Section
SERA	Syracuse Environmental Research Associates
SHPO	State Historic Preservation Officer
SMZ	Special Management Zone
SPM	Suspended Particulate Matter
SO_x	Sulfur Oxides
T&E	Threatened and Endangered
TRI	Toxic Release Inventory
U.S.	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDAFS	United States Department of Agriculture, Forest Service
USEPA	U.S. Environmental Protection Act
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WSDOT	Washington State Department of Transportation

1. PURPOSE AND NEED FOR ACTION

The principal purpose of maintaining the habitats at Eglin Air Force Base (AFB) is to support military testing and training. Due to the varied needs of Eglin missions, a variety of habitats is necessary, ranging from dense forests to cleared ranges. To better maintain the spectrum of habitats, the Air Force proposes to implement an integrated vegetation management program on Eglin AFB that would support not only the current military missions, but also those in the foreseeable future (e.g., Base Realignment and Closure [BRAC] beddown). The program would combine the beneficial attributes of a variety of herbicides, prescribed burning, and other techniques to accomplish the following tasks, in order of priority: 1) support the military mission, 2) aid ecosystem management (including threatened and endangered [T&E] species), 3) make efficient use of the shrinking range maintenance budget, and 4) control invasive non-native plant species (INPS). One major goal of the proposed program is to reduce and/or phase out current mechanical vegetation management practices (mowing, roller-drum chopping, chainsaws, hand-held saws) and allow for chemical vegetation management in areas where mechanical means are not possible or desirable. Program implementation would reduce vegetation control operation costs, erosion and stream sedimentation, and impacts to sensitive species and habitat associated with land test areas. Also, the Proposed Action would provide Eglin AFB natural resource managers with flexible vegetation management tools for sensitive species habitat improvement, particularly restoration of longleaf pine savannas for species such as the red-cockaded woodpecker. Other portions of the reservation would be maintained in habitat conditions as required by the military mission.

1.1 PROPOSED ACTION

The Proposed Action would occur on Eglin AFB. Eglin AFB occupies approximately 464,000 acres in Santa Rosa, Okaloosa, and Walton Counties of the Florida Panhandle (Figure 1-1). Eglin test areas provide bombing, gunnery, and other testing and training for pilots and troops in the Air Force, Army, Navy, and Marines. The range functions as both a testing and conventional delivery range. The Eglin Range is composed of approximately 50,000 acres of land test ranges, 385,000 acres of the interstitial areas, and about 25,000 acres in the cantonment areas.

The Air Force Air Armament Center (AAC) has responsibility for the Eglin Military Complex and for all its users, which include the Department of Defense (DoD), other government agencies, foreign countries, and private companies. For range operations, AAC provides environmental analyses and necessary National Environmental Policy Act (NEPA) documentation to ensure compliance with Air Force policy and applicable federal, state, and local environmental laws and regulations.

AAC includes two wings and four directorates that collectively operate, manage, and support all activities on the Eglin Military Complex. The AAC accomplishes its range operations through the 46th Test Wing with support from the 96th Air Base Wing. The 46th Test Wing Commander is responsible for day-to-day scheduling, executing, and maintaining this national asset. The

continued DoD utilization of the Eglin Military Complex requires flexible and unencumbered access to land ranges and airspace, which support all of Eglin's operations.

The Proposed Action involves the approval for and use of various herbicides on Eglin AFB for land test area maintenance, line of site maintenance, helicopter landing zone (HLZ) maintenance, red-cockaded woodpecker (RCW) and native ecosystem restoration, INPS control, and native plant nursery development. The Air Force proposes to use herbicides on Eglin's test areas and interstitial areas to control vegetation, including, but not limited to, live oak, laurel oak, turkey oak, and waxy shrubs such as gallberry, greenbrier, and wax myrtle.

1.2 NEED FOR PROPOSED ACTION

The Air Force needs to maintain many of the Eglin AFB land test areas (Figures 1-1 and 1-2) as grassy habitat in order to allow unimpeded observations and lines-of-sight (LOS) for evaluating munitions tests and for scoring and retrieving test items. Additionally, grassy habitats minimize the effects of munitions-caused wildfires. Many user groups on Eglin are interested in transitioning from the exclusive use of mechanical equipment for maintaining vegetation on test areas to the use of herbicides, prescribed fire, and limited mechanical equipment.

Eglin currently uses only the forest herbicide hexazinone (3-cyclohexyl-6-(dimethylamino)-1-methyl,3,5-triazine-2,4-(1*H*,3*H*)-dione) for test area maintenance. Hexazinone is very effective against oaks but is less effective against pines and other nontarget species, such as gallberry. Hexazinone requires application during the early growing season and present guidance restricts application to the sandhills. Use of additional types of herbicides would allow Eglin to target other areas and types of vegetation, including vegetation near aquatic areas, vegetation in unexploded ordnance (UXO) areas, waxy species, and pine species. The approval for the use of other herbicides would allow application in all seasons and would allow longleaf restoration in flatwoods and other habitats where the Air Force does not currently use hexazinone. The Proposed Action would improve current RCW and ecosystem restoration efforts, and reduce sedimentation impacts to the Okaloosa darter. Cost savings for test area maintenance is also a significant need and the Proposed Action would be more economically feasible than current vegetation management methods. Current analysis indicates that cost savings would be over $2 million dollars per year or $20.5 million every 10 years (Seiber pers. comm., 2006).

Native groundcover species are an important part of native ecosystems on Eglin, and, therefore, are important to ecosystem restoration. The Eglin AFB Native Grass Operational Plan (U.S. Air Force, 2005) calls for establishment of native plant seed orchards to promote restoration of native ecosystems. The successful establishment of these seed orchards requires the elimination of non-native sodgrasses and other species, which would involve the use of herbicides.

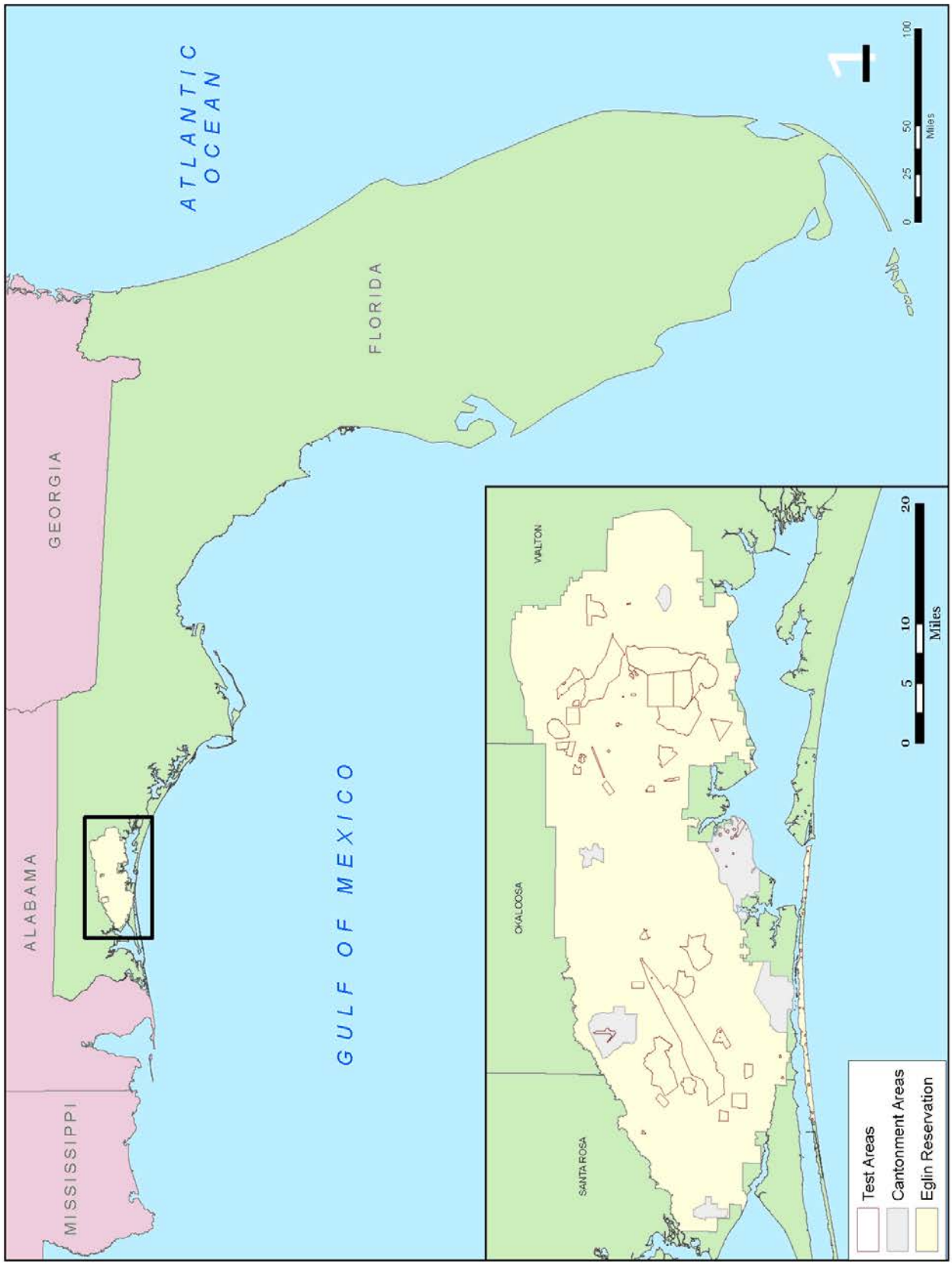

Figure 1-1. Regional Location of Eglin AFB

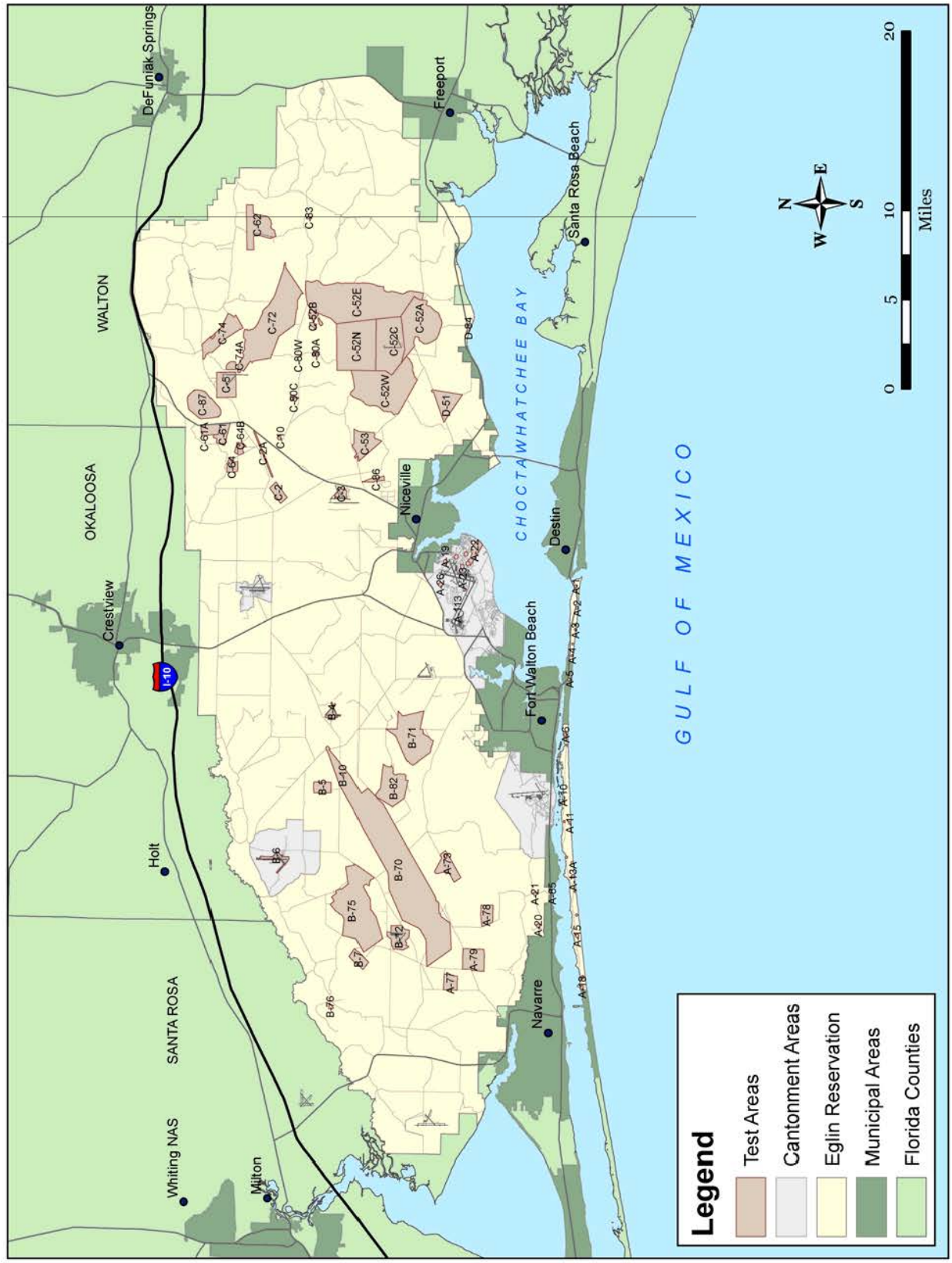

Figure 1-2. Eglin AFB Test Areas

In the absence of fire or some other method to control undesirable vegetation, native longleaf and slash pine seedlings are often out-competed by more aggressive species such as sand pine and oaks. Because it is not possible to conduct prescribed burns in some areas, managers need alternative options to control these species. Mechanical vegetation control (heavy equipment, chainsaws, and hand-held saws) and ground application of herbicides are labor intensive and costly; aerial herbicide application provides an alternative method at reduced labor and monetary expense, and additionally reduces the potential for soil erosion and sedimentation of streams and wetlands.

Without treatment, negative impacts in the regeneration of native longleaf and slash pine will occur, along with associated native understory species. Healthy longleaf pine forests and native groundcover species are essential for the recovery of federally listed species. Coordinated use of chemical application, mechanical removal, and prescribed burning would be used to reduce aggressive hardwood, pine, and herbaceous species in order to promote sustainable longleaf pine and natural grass communities.

The Natural Resources Section (NRS) of Eglin AFB currently conducts herbicide treatments of all known INPS on Eglin. Nationally, invasive species are the number two cause of listing on the Threatened and Endangered Species List (after habitat degradation). Once established, INPS reduce biological diversity and disrupt the integrity of native ecosystems by out-competing native species. This reduction in biological diversity reduces the suitability of the habitat for both plant and animal species and may contribute to a decrease in range sustainability through the disruption of native ecosystems. To prevent the spread and infestation of INPS in natural areas, the early detection and rapid response to control them is critical for their long-term management.

1.3 OBJECTIVE OF THE PROPOSED ACTION

The objective of herbicide application on Eglin's test areas is to control target vegetation in order to meet specific program objectives; for example, to observe armament testing or to minimize armament-caused fire. On defined land test areas, the goal is to kill woody vegetation and maintain a grassy herbaceous cover. The objective of herbicide application in sensitive habitats (such as RCW foraging habitat) across the Eglin Range Complex is to minimize hardwood midstories while favoring longleaf pines and associated groundcover and understory species. These sensitive habitats, critical to respective species, are valuable because of their unique role in an ecosystem and can be easily disturbed or degraded by various human activities. The objective of herbicide application to INPS on Eglin is to kill and stop the spread of current infestations. Eglin AFB would begin purchasing and utilizing herbicides as soon as all documentation has occurred and approval is obtained.

1.4 RELATED ENVIRONMENTAL DOCUMENTS

There are several environmental documents related to the current action. These include:

- Biological Assessment to Determine Potential Impacts to Federally Listed Species Resulting from the Application of the Forest Herbicide Hexazinone on Eglin's Interstitial Forest Lands (U.S. Air Force, 2001, March).
- Biological Assessment to Determine Potential Impacts to Federally Listed Endangered Species Resulting from the Application of the Forest Herbicide Hexazinone on Eglin's Land Test Areas (U.S. Air Force, 2000, Nov).
- Concurrence Letter from the U.S. Fish and Wildlife Service (USFWS) Regarding the Application of the Forest Herbicide Hexazinone on Eglin's Interstitial Forest Lands (USFWS, 2001, Sept.).
- Concurrence Letter from the USFWS Regarding the Application of the Forest Herbicide Hexazinone on Eglin's Land Test Areas (USFWS, 2001a, June).
- Biological Assessment to Determine Potential Impacts to Federally Listed Endangered Species Resulting from the Application of Herbicides to Treat INPS on Eglin's range. (U.S. Air Force, 2002, Aug).
- Test Area Maintenance Programmatic Environmental Assessment (U.S. Air Force, 1999, May).
- Test Area Maintenance Environmental Baseline Document Update (U.S. Air Force, 2006, March).
- Integrated Natural Resources Management Plan 2007, Eglin AFB, FL (U.S. Air Force, 2006a).
- Eglin AFB Native Grass Operational Plan (U.S. Air Force, 2005).
- Test Area C-62 Maintenance Plan (U.S. Air Force, 2005a).
- Test Area C-52 Maintenance Plan (U.S. Air Force, 2005b).
- Test Area C-72 Maintenance Plan (U.S. Air Force, 2005c).
- Test Area C-74 Maintenance Plan (U.S. Air Force, 2005d).
- Test Area B-70 Maintenance Plan (U.S. Air Force, 2006b).

1.5 SCOPE OF ENVIRONMENTAL ASSESSMENT

This document was prepared in accordance with the requirements of NEPA of 1969, the Council on Environmental Quality (CEQ) regulations of 1978, and 32 Code of Federal Regulations (CFR) Part 989. This EA considers the effects from the Proposed Action, which is the Preferred Alternative, Alternative 1, and a No Action Alternative.

1.5.1 Issues Eliminated from Detailed Assessment

Based on the scope of the Proposed Action, Alternative 1, and the No Action Alternative and a preliminary analysis, the following issues were eliminated from further analysis.

Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) of 1966 requires that federal agencies analyze the impacts of federally directed or funded undertakings on historic properties. There are significant cultural resources, including archaeological sites and historic structures located throughout the Eglin Range. Eglin does not expect any negative impacts to these resources as a result of the Proposed Action. Additionally, decreasing the frequency of ground disturbing activities (by bush hogging and roller-drum chopping) would serve to protect surface and subsurface resources. Therefore, the Air Force excluded Cultural Resources from any further analysis.

Cultural resources sites are avoided where possible in nearly all activities conducted on Eglin AFB. In the rare events where they cannot be avoided, the Base Historic Preservation Officer and the State Historic Preservation Officer (SHPO) would develop mitigation strategies to recover cultural resources prior to the activity that would disturb a site. All ground-disturbing activities at Eglin are subject to prior consultation and approval by Eglin's Historic Preservation Section that oversees and maintains records on all cultural resource activities on the base. Any findings of historic artifacts during herbicide application must be reported to the 96th Civil Engineering Group, Environmental Management Division, Cultural Resources Branch (96 CEG/CEVH) immediately so they can implement further site evaluation and protection measures.

Noise

Noise associated with the Proposed Action would result from the aerial dispersal of herbicides from a helicopter and/or a fixed-wing airplane. Noise from ground application of herbicides would be from motorized vehicles such as trucks, trackers, all-terrain vehicles (ATVs), and skidders. All herbicide application would occur within the Eglin AFB boundary (Figure 1-1). The use of a helicopter or fixed-wing airplane, and various motorized vehicles, a few times per year would not significantly contribute to the current noise environment of Eglin AFB. In addition, the actions would take place on remote test ranges and locations on Eglin AFB already subject to elevated levels of noise production. Given these factors, Eglin does not anticipate noise impacts to the public from herbicide application methods. Therefore, noise impacts to the public were not considered for further analysis.

Land Use

There would be no effects to land use. Application of the proposed herbicides would occur in new areas but would not change the land use. No change to surrounding land use or to current Air Installation Compatibility Use Zones (AICUZ) would occur.

1.5.2 Issues Studied in Detail

Preliminary analysis based on the scope of the Proposed Action identified the following potential environmental issues warranting additional detailed analysis.

Soils

The herbicides and adjuvants (chemical components that increase the effectiveness of the herbicide) that would be used may potentially cause soil contamination by residual herbicides in the soil. Discussion of soil impacts focuses on analyzing the potential for impacts, identifying where impacts may take place, and determining management options to avoid and/or minimize identified impacts. Contamination is defined as any substance that degrades an environmental resource or makes it unfit or unsafe for its typical use. For the herbicides in the Proposed Action, soil contamination is more of an issue with spills, or if misapplied. Residual herbicides, if applied correctly, applied in the correct place, and under specified thresholds, are not contamination.

Water Resources

Proposed herbicides, adjuvants, and application methods may affect water resources through chemical pollution or sedimentation. Off-road use of vehicles during ground herbicide application could lead to erosion resulting in degraded water quality and habitat. Issues to be examined during analyses include the pollutant capabilities of the herbicides and adjuvants, locations of streams and wetlands on Eglin AFB, potential for those water bodies to be impacted, and a discussion of management activities that can minimize or avoid these impacts.

Air Quality

The addition of combustive byproducts and airborne herbicides to the air resulting from herbicide application activities and post-application prescribed burning may affect air quality. A negative impact would be denoted if hazardous air pollutants from herbicides drift with the aerial application or if prescribed burning in treated areas would emit potential toxic substances. General information regarding herbicide use, application, and affects to treated areas followed by a prescribed burn is used for this analysis.

Biological Resources

Chemical materials and vegetation control application methods may affect plant and animal species and related habitats. Impacts analysis focuses on the potential direct impacts, habitat alteration, and harassment from vegetation management control activities. Particular species of concern are the RCW, Okaloosa darter, flatwoods salamander, Florida bog frog, dusky gopher frog, and other species that depend on aquatic habitats. The RCW and aquatic species may realize an overall beneficial impact from the Proposed Action due to a reduction in impacts to understory vegetation and a reduction in sedimentation due to bush hogging and roller-drum chopping.

Socioeconomic Resources

Socioeconomics addresses the potential for both positive and negative impacts to the local economy resulting from the Proposed Action. Preliminary screening of this issue indicates that there would be some negative socioeconomic impacts associated with the Proposed Action, such as the possible loss of jobs due to the decreased need of bush hogging and roller-drum chopping. However, if the Proposed Action is not implemented then certain test areas will become unusable. Without usable test areas, some organizations currently at Eglin would have to develop other testing methods or leave Eglin AFB to use test areas elsewhere. If any of the organizations on Eglin were to relocate to another base a loss of jobs would occur, which would negatively affect the local economy.

Environmental Justice and Risks to Children

Environmental justice addresses the potential for a proposed federal action to cause disproportionately high and adverse health effects on minority populations or low-income populations. Potential impacts are identified as minority or low-income communities disproportionately exposed to herbicides or denied access to public lands during herbicide application activities as compared with the general population.

Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, mandates that all federal agencies assign a high priority to addressing health and safety risks to children. The EO also requires that federal agencies coordinate research priorities on children's health and ensure that their standards take into account special risks to children. Potential impacts to children would involve possible exposure to airborne herbicide spray droplets.

Safety

Safety, as it relates to this document, addresses issues related to herbicide application personnel and exposure to the herbicides and adjuvants. Herbicides that Eglin proposes to use have a low toxicity to mammals. The analysis would address the potential safety and health risks the proposed herbicide application activities would have if exposure to an individual were to occur.

1.6 APPLICABLE REGULATORY REQUIREMENTS AND COORDINATION

AAC would submit a Coastal Zone Management Act (CZMA) Consistency Determination to the Florida Department of Environmental Protection (FDEP) (Appendix C). State response is provided in Appendix C, Attachment C-1.

The AAC conducted an Endangered Species Act (ESA) Section 7 consultation with the USFWS for potential impacts to terrestrial and marine threatened and endangered (T&E) species and critical habitat. The AAC will comply with the management requirements of the Biological Assessment attached to this Environmental Assessment as Appendix D, Attachment D-1.

Eglin is currently operating under a Title V air operation permit. This permit regulates all stationary air emission sources on the Reservation. One category of emission sources regulated

under the permit is the "unregulated" source category. These sources are not regulated by any specific federal or state regulation but are regulated by the facility-wide requirements of the permit. Research and development activities that are conducted on the Eglin test ranges are included in the unregulated source category. As a result, the Proposed Action would be considered an unregulated source of emissions under Eglin's Title V permit and, therefore, would not require further permitting action. However, Eglin must report to the 96th Civil Engineer Squadron, Environmental Engineering Section (96 CEG/CEVCE) the types and amount of herbicides used for inclusion in Eglin's annual air emissions inventory report that the FDEP requires.

1.7 DOCUMENT ORGANIZATION

This EA follows the organization established by the CEQ regulations (40 CFR, Parts 1/500-1508). This document consists of the following chapters:

1. Purpose and Need for Action
2. Description of Proposed Action and Alternatives
3. Affected Environment
4. Environmental Conséquences
5. Cumulative Impacts
6. Plans, Permits, and Management Requirements
7. List of Preparers
8. List of Contacts
9. References

2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

As required by federal regulations, this Environmental Assessment (EA) addresses the possible environmental impacts of the Proposed Action, Alternative 1, and a No Action Alternative. Section 2-4 summarizes the issues and potential impacts associated with the Proposed Action, Alternative 1, and the No Action Alternative.

2.1 PROPOSED ACTION (PREFERRED ALTERNATIVE)

Eglin proposes an increase in the use of herbicides and prescribed fire to manage vegetation on test areas and interstitial areas, restore RCW and native ecosystems, control INPS, and develop a native plant nursery, while concurrently decreasing the use of mechanical control methods (mowing, bush-hogging, chainsaws, hand-held saws). The Proposed Action would involve an expansion of the list of approved herbicides beyond just hexazinone (Table 2-1). (Note: An example of a common trade name is provided for reference. However, herbicides may have multiple trade names if marketed for different uses and by different companies). Herbicide treatments would continue on an as-needed basis to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance. Aerial application of herbicides is proposed for certain areas on Eglin AFB. Current and new mitigations would be required as part of the Proposed Action (see subsections on Application Methods and Management Requirements for Herbicide Applications sections).

The Proposed Action includes promotion of native groundcover species through use of directed application methods, specific herbicide formulations, and/or application timing. The Proposed Action includes implementing standard avoidance and minimization measures for sensitive habitat and species protection; spill prevention, cleanup, and containment; adherence to herbicide labels and instructions during handling, mixing, and application of herbicides; and health and safety precautions. Expanded herbicide use is proposed for the Eglin mainland reservation (excluding areas that will be avoided as identified in this document).

Description of Herbicides

Herbicides encompass liquid, solid, or gaseous substances that are released to the environment as a result of vegetation maintenance activities. These would include active ingredients as well as adjuvants used in herbicide application. Release of these materials may potentially affect air quality, water quality, soils, and sediments.

Prior to 1993, the herbicide hexazinone (3-cyclohexyl-6-(dimethlyamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione) was used extensively to control unwanted woody vegetation at Eglin AFB on reforestation areas. Approximately 8,000 acres received a one-time application of the herbicide in dosages less than 5 pounds of active ingredient per acre (U.S. Air Force, 1998a). In the early 1980s, hexazinone was also applied to C-72 and C-52N. Hexazinone, fire, roller-drum chopping, and bush hogging are currently the only vegetation maintenance methods used on Eglin AFB.

According to the Resource Conservation and Recovery Act (RCRA), Section 6903(5), hazardous materials and waste are defined as substances that, because of "quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to increases in mortality or serious illnesses, or pose a substantial threat to human health or the environment." Hazardous materials as referenced here pertain to mission related hazardous chemicals or substances meeting the requirements found in 40 CFR 261.21.24, are regulated under RCRA, and are guided by Air Force Instruction (AFI) 32-7042. The hazardous materials to be transported and used on site for the Proposed Action and Alternative 1 consist of herbicides as well as adjuvants used in herbicide application. A description of the proposed herbicides can be found in Table 2-1.

Herbicides

In contrast to insecticides, herbicides are short-lived in the environment. Although the retention of residues varies depending on the specific chemical used, environmental condition, vegetation density, and soil properties, herbicides degrade within days or weeks, rather than months or years common to many other classes of pesticides. The rate of degradation is defined as the half-life, which is the time it takes for the herbicide to degrade so that only 50 percent of the applied quantity is still present in the environment. More specifically, once applied, herbicide residues are subject to degradation through volatilization, adsorption, leaching, plant uptake, and numerous chemical and biological processes (Morrison and Meslow, 1983; Table 2-1).

Table 2-1. Herbicide Half-Life

Herbicide	Example Trade Names	Half-life
Aminopyralid	Milestone™	30 days
Fluroxypyr	Vista®	36 days
Fosamine	Krenite®	7 days
Glyphosate	Accord® XRT	< 25 days
	Rodeo® (aquatic)	< 14 days
Imazapic	Plateau®	25-142 days
Imazapyr	Arsenal®	25-142 days
	Chopper®	25-142 days
	Habitat® (aquatic)	25-142 days
Metsulfuron	Escort®	7-42 days
Sulfometuron methyl	Oust® XP	30 days
Triclopyr	Garlon® 3a	10-46 days
	Garlon 4 Ultra	10-46 days
	Renovate® 3 (aquatic)	< 4 days

Table information taken from Active Ingredient Fact Sheets in Appendix B.

Table 2-2 illustrates the LD_{50} (Median Lethal Dose) and LC_{50} (Median Lethal Concentration) amounts of herbicide that would be required to kill half the members of a tested population. Acute toxicity is commonly measured by the lethal dose (LD) or lethal concentration (LC) that causes death in 50 percent of treated laboratory animals. LD_{50} indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). LC_{50} is the concentration of a chemical per volume of air or water and is expressed as milligrams per liter (mg/L). Chemicals are highly toxic when the LD_{50} or LC_{50} value is small and practically nontoxic when the value is large.

The U.S. Environmental Protection Agency (USEPA) rates the toxicity of herbicides based on the toxicity criteria shown in Table 2-3. All of the herbicides proposed for use in the Proposed Action and Alternative 1 are classified as USEPA Category III, except for Vista/Fluroxypyr (Category II), Chopper (Category II), Garlon 3A/Triclopyr (Category I), and Renovate 3/Triclopyr (Category I) (Tables 2-2, 2-3, and 2-4).

Table 2-2. Median Lethal Dose/Concentration (LD_{50}/LC_{50}) of the Proposed Action Herbicides on Animals

Trade Name	Chemical	Fish	Birds	Rats		
		LC_{50} = mg/L for 96 hours	LD_{50} = mg/kg	Oral LD_{50} = mg/kg	Inhalation LC_{50} = mg/L for 4 hours	Dermal LD_{50} = mg/kg
Milestone	Aminopyralid	>100	>2000	>5000	>5.79	>5000
Vista	Fluroxypyr	No Data	>2000	3162	>6.2	>2000[R]
Accord	Glyphosate	10-100	No Data	>5000*	>5.25*	>5000*
Rodeo	Glyphosate	>100	>2000	>5000	>6.37	>5000[R]
Garlon 3A	Triclopyr	10-100	No Data	1847	No Data	>5000[R]
Garlon 4	Triclopyr	0.1-1	No Data	1338	No Data	>5000
Garlon 4 Ultra	Triclopyr	0.1-1	501-2000	No Data	No Data	No Data
Renovate 3	Triclopyr	10-100	No Data	1847	No Data	>5000[R]
Krenite	Fosamine	330	>5000	>5000	>5.8	>5000[R]
Escort	Metsulfuron	150	>2510	>5000	>5.3	>2000[R]
Oust	Sulfometuron Methyl	148	>5000	>5000	>5.3	>5000[R]
Plateau	Imazapic	>100	>5000	>5000	>2.38	>5000[R]
Arsenal	Imazapyr	>100	>5000	>5000	>4.62	>2000[R]
Chopper	Imazapyr	>100	>5000	>5000	>1.58	>5000[R]
Habitat	Imazapyr	>100	>5000	>5000	>4.62	>2000[R]

*LD_{50} and LC_{50} for this compound have not been determined. The LD_{50} and LC_{50} values given are for a similar material.
R = Testing was performed on rabbits.
Information in this table was obtained from Dow AgroSciences, Cerexagri, Inc., DuPont, SePRO and BASF Material Safety Data Sheets in Appendix B. Mention here does not imply government endorsement of the product.

Table 2-3. USEPA Toxicity Category Criteria for Pesticides

Toxicity Category*	Signal Word	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (mg/L)	Eye Irritation	Skin Irritation
I	DANGER Poison	0-50	0-200	0-0.2	Corrosive; corneal opacity not reversible within 7 days	Corrosive
II	WARNING	>50-500	>200-2000	>0.2-2.0	Corneal opacity reversible within 7 days; irritation persisting for 7 days	Severe irritation at 72 hours
III	CAUTION	>500-5000	>2000-20,000	>2.0-20	No Corneal opacity; irritation reversible within 7 days	Moderate irritation at 72 hours
IV	NONE	>5000	>20,000	>20	No Irritation	Mild irritation at 72 hours

*Toxicity goes down as the Category number goes up, USEPA Category I is most toxic while Category IV is least toxic.
Source: U.S. Environmental Protection Agency, 2006. Human Health Risks. Accessed on 22 December 2006. http://www.epa.gov/oppfead1/labeling/lrm/chap-07.htm.

Table 2-4. Proposed Herbicide Active Ingredient Toxicity Signal Word and Category

Herbicide	Acute Oral Toxicity	Acute Dermal Toxicity	Acute Inhalation	Primary Eye Irritation	Primary Skin Irritation	USEPA Toxicity Category
Aminopyralid	None	None	None	None	None	IV
Fluroxypyr	Caution	Caution	Caution	Warning	Caution	II
Fosamine	Caution	Warning	Caution	Warning	Caution	II
Glyphosate	None	None	Caution	Warning	None	II
Imazapic	None	Caution	None	None	Caution	III
Imazapyr	None	Caution	Caution	Caution	Caution	III
Metsulfuron Methyl	None	Caution	Caution	Warning	Caution	II
Sulfometuron Methyl	Caution	Caution	Caution	None	None	III
Triclopyr	Caution	Caution	Caution	Caution/Danger	Caution	I

Acute toxicity tests measure the effects of high dose levels on populations over a short amount of time (i.e., days or hours). These levels are generally much greater than would be seen in the environment during and after the actual herbicide application. However, the LD_{50} and LC_{50} do not reflect potential health effects such as cancer, birth defects, or reproductive toxicity that may occur at levels of exposure below those that cause death. When continued exposure to low levels of a chemical over a long period causes health problem such as cancer, birth defects, reproductive problems, or gene mutation, it is considered to have "chronic effects."

During the acute toxicity studies, several dose levels are given and lethality and other effects are monitored. In contrast, several dose levels are given in chronic toxicity studies and the highest level(s) must cause clear adverse affects, but not death. This testing is required in order to evaluate carcinogenicity. The USEPA determines chronic toxicity during the registering process required for all herbicides on the market. Table 2-5 contains chronic toxicity information for the proposed herbicide active ingredients.

Table 2-5. Chronic Toxicity Summary of the Proposed Herbicide Active Ingredients

Herbicide Active Ingredient	Potential Chronic Effects			
	Carcinogenic (Cancer)	Teratogenic (Birth Defects)	Reproductive	Mutagenic (Gene Mutation)
Aminopyralid	Aminopyralid is classified as "not likely to be carcinogenic to humans" based on the lack of evidence for carcinogenicity in mice and rats. (USEPA, 8/10/2005)	There is no quantitative or qualitative evidence of increased susceptibility of developmental toxicity studies. (USEPA, 8/10/2005)	There is no quantitative or qualitative evidence of increased susceptibility following pre-, post-natal exposure. (USEPA, 8/10/2005)	There is no quantitative or qualitative evidence of increased susceptibility following pre- /post-natal exposure. (USEPA, 8/10/2005)
Fluroxypyr	Fluroxypyr is classified as a "not likely" human carcinogen. (USEPA, 9/30/98)	Fluroxypyr does not demonstrate developmental toxicity. (USEPA, 9/30/98)	Fluroxypyr does not demonstrate reproductive toxicity. (USEPA, 9/30/98)	The available studies indicate that fluroxypyr was not mutagenic in bacteria. (USEPA, 9/30/98)

Table 2-5. Chronic Toxicity Summary of the Proposed Herbicide Active Ingredients Cont'd

Herbicide Active Ingredient	Potential Chronic Effects			
	Carcinogenic (Cancer)	Teratogenic (Birth Defects)	Reproductive	Mutagenic (Gene Mutation)
Fosamine	No chronic (long-term) studies are available for fosamine. Scientists have not tested fosamine ammonium for carcinogenicity. (WSDOT, 2006)	No chronic (long-term) studies are available for fosamine. (WSDOT, 2006)	Fosamine did not cause adverse reproductive effects when fed to rats at high doses. (WSDOT, 2006)	Fosamine ammonium displayed some mutagenic potential in one *in vitro* test for chromosome aberrations, while four other tests were negative for mutagenic potential. (USEPA Re-registration, 1995)
Glyphosate	USEPA classified as evidence of noncarcinogenicity for humans. (SERA, Page 3-16)	Pregnant rats (up to 3,500 mg/kg/day) and rabbits (up to 350 mg/kg/day) indicated no evidence of birth defects. (SERA, Page 3-13)	Multigenerational studies of rats, no adverse effects on fertility or reproduction with doses up to 30 mg/kg/day. (SERA, Page 3-13)	No *in vivo* studies using mammalian species or mammalian cell lines have reported mutagenic activity. (SERA, Page 3-17)
Imazapic	USEPA classified as not likely to be carcinogenic for humans. (SERA, Page 3-5)	Two rat studies showed no signs of teratogenicity at the highest dose tested (i.e., 1000 mg/kg/day). (SERA, Page 3-4)	Multigenerational rat study showed no indication of any effect on reproductive performance. (SERA, Page 3-5)	Four assays produced negative results for mutagenicity. (SERA, Page 3-5)
Imazapyr	USEPA has categorized imazapyr as Class Evidence of noncarcinogenicity. (SERA, Page 3-7)	Five studies show imazapyr does not cause adverse developmental effects. (SERA, Page 3-6)	Five studies reveal that imazapyr does not cause adverse reproductive effects. (SERA, Page 3-6)	Three studies have shown negative potential for potential mutagenic activity. (SERA, Page 3-7)
Metsulfuron Methyl	USEPA concluded that "Metsulfuron methyl was not oncogenic in the chronic rat and mouse bioassays. (SERA, Page 3-7)	USEPA –"The results of a series of studies indicated that there were no teratogenic hazards associated with the use of metsulfuron methyl. (SERA, Page 3-6)	USEPA-"The results of a series of studies indicated that there were no reproductive, hazards associated with the use of metsulfuron methyl. (SERA, Page 3-6)	USEPA concluded that "Metsulfuron methyl was not mutagenic in the chronic rat and mouse bioassays. (SERA, Page 3-7)
Sulfometuron Methyl	Four studies find that exposure to sulfometuron poses no carcinogenic risk to humans. (SERA, Page 3-8)	The No Observable Adverse Effect Level for teratogenic effects is 300 mg/kg/day. (SERA, Page 3-7)	No adverse effects on reproductive parameters were observed in rats exposed to dietary sulfometuron methyl at dietary concentrations up to 5000 ppm. (SERA, Page 3-8)	Four studies show no mutagenic activity. (SERA, Page 3-8)

Table 2-5. Chronic Toxicity Summary of the Proposed Herbicide Active Ingredients Cont'd

Herbicide Active Ingredient	Potential Chronic Effects			
	Carcinogenic (Cancer)	Teratogenic (Birth Defects)	Reproductive	Mutagenic (Gene Mutation)
Triclopyr	USEPA classified as Group D chemical (not classifiable as to human carcinogenicity) because of marginal response in mice/rats, and the absence of additional support from structural analogs or genotoxicity. (SERA, Page 3-9 & USEPA Re-registration, 1998)	Studies show that teratogenic effects occur only at doses that are maternally toxic. At doses that do not cause maternal toxicity, there is not apparent concern for teratogenic effects. (SERA, Page 3-8)	Studies show that reproductive effects occur only at doses that are maternally toxic. At doses that do not cause maternal toxicity, there is not apparent concern for teratogenic effects. (SERA, Page 3-8)	Negative in several tests, but weakly positive in a test in rats. (SERA, Page 3-10)

Source: (USDAFS, 2006); SERA = Syracuse Environmental Research Associates

Herbicides are governed by the Federal Insecticide, Fungicide and Rodenticide Act, which regulates their sale and use in the United States. The law requires private industry and federal facilities to properly label containers, train workers, follow protection standards, safely manage, store and dispose of, and keep accurate records of these materials.

Adjuvants

Adjuvants are compounds added to herbicide solutions to improve the performance of an herbicide, and or the ease and accuracy of herbicide application (i.e., decrease drift). The most effective adjuvants vary from herbicide to herbicide and can be a surfactant, fertilizer, or oil. Surfactant and oil adjuvants promote herbicide adherence and decrease spray solution surface tension. This causes the herbicide to "stick" and "spread out" across vegetation surfaces, instead of beading up like a water droplet. Lowering the surface tension and increasing the adherence of the spray makes the herbicide solution more effective, especially to waxy leaf species. Fertilizer adjuvants increase the herbicide activity on some weed species (USDAFS, 2006).

As mentioned earlier, there is no one adjuvant that works well for all herbicides. Herbicide manufactures usually recommend certain adjuvants for that formulation and different application methods. These recommendations can be found on the herbicide label.

Eglin would use these herbicides as appropriate for site conditions and management targets. Table 2-6 lists the target species, application methods, and chemical properties of the proposed herbicides. Table 2-7 lists environmental hazards and associated mitigations (or management requirements) for each herbicide proposed. The Proposed Action includes adherence to herbicide labels including USEPA suggested mitigations identified in Table 2-7.

Table 2-6. Proposed Herbicides and Environmental Hazards

Herbicide	Example Trade Name	Environmental Hazards (label)
Aminopyralid	Milestone	Aminopyralid is not toxic to bees and non-toxic to aquatic organisms on an acute basis. Aminopyralid is practically nontoxic to birds on an acute or dietary basis. Based largely or completely on information for aminopyralid, bioconcentration potential for Milestone™ is low. It is relatively immobile in soil, with most of the chemical remaining within the upper 12" of the soil profile. Products containing aminopyralid can not be applied directly to water, but can be used to treat banks of ditches or other channels that do not carry water used for irrigation or drinking. Applications should be avoided to areas where movement into water used for irrigation or drinking could occur.
Fluroxypyr	Vista	Toxic to fish. Drift or runoff from treated areas may be hazardous to aquatic organisms and nontarget plants. Do not apply directly to water, to areas where water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
Fosamine	Krenite	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
Glyphosate	Accord XRT	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
	Rodeo (aquatic)	Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.
Imazapic	Plateau	For terrestrial use only. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This chemical demonstrates the properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground-water contamination. This product may contaminate water through drift or spray wind. This product has the high potential for runoff for several months or more after application. Poorly draining soils and soils with shallow watertables are more prone to produce runoff that contains this product. A level, well maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential for contamination of water from rainfall-runoff. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours.
Imazapyr	Arsenal	For terrestrial uses. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This herbicide is phytotoxic at extremely low concentrations. Nontarget plants may be adversely affected from drift.
	Chopper	Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This herbicide is phytotoxic at extremely low concentrations. Nontarget plants may be adversely affected from drift.
	Habitat (aquatic)	Do not apply to water except as specified in this label. Treatment of aquatic weeds may result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss may cause the suffocation of some aquatic organisms. Do not treat more than one half of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move to untreated areas. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This pesticide is toxic to vascular plants and should be used in

Herbicide	Example Trade Name	Environmental Hazards (label)
		accordance with drift precautions on label.
Metsulfuron	Escort	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely affected from drift and runoff.
Sulfometuron methyl	Oust XP	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
Triclopyr	Garlon 3a	Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
	Garlon 4 Ultra	This product is highly toxic to fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or equipment washwaters. This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow may result in groundwater contamination.
	Renovate 3 (aquatic)	Under certain conditions, treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants, which may contribute to fish suffocation. Therefore, to minimize this hazard, do not treat more than one-third to one half of the water area in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. Consult with the State agency for fish and game before applying to public water to determine if a permit is needed.

*Information in this table was obtained from Dow AgroSciences, Cerexagri, Inc., DuPont, SePRO and BASF Material Safety Data Sheets.

Table 2-7. Target Species, Application Methods, and Chemical Properties

Herbicide	Example Trade Names	*Target Species*						*Application Methods*							*Chemical Properties*	
		Broadleaf Weeds	Woody Plants	Annual & Perennial Grasses	Vines and Brambles	Aquatic Plants	Pine	Ground	Aerial	Maximum Application Rate	Season Applied	Treatment			Mode of Action	Half-life
												Foliar	Basal *	Soil		
Aminopyralid	Milestone™	✓						✓	✓	3-7 ounces per acre per year	Spring or Fall	✓			hormone (auxin) mimic	30 days
Fluroxypyr	Vista®	✓	✓					✓	✓	2 2/3 pints per acre per year	Dependent upon plant species treated	✓			hormone (auxin) mimic	36 days
Fosamine	Krenite®		✓				✓	✓	✓	3 gallons per acre per year	Mid-summer to late summer/fall	✓			bud inhibitor	7 days
Glyphosate	Accord® XRT	✓	✓				✓	✓	✓	8 qt per acre per year (total glyphosate)	Dependent upon plant species treated	✓			enzyme inhibitor	< 25 days
	Rodeo® (aquatic)	✓	✓	✓	✓	✓	✓	✓	✓	8 qt per acre per year (total glyphosate)	Dependent upon plant species treated	✓			enzyme inhibitor	< 14 days
Imazapic	Plateau®	✓		✓	✓			✓	✓	12 ounces per acre per year	Dormant or growing season	✓		✓	enzyme inhibitor	25-142 days
Imazapyr	Arsenal®	✓	✓	✓	✓			✓	✓	Dependent upon plant species treated	Dependent upon plant species treated	✓	✓	✓	enzyme inhibitor	25-142 days
	Chopper®	✓	✓	✓	✓			✓	✓	Dependent upon plant species treated	Dependent upon plant species treated	✓	✓	✓	enzyme inhibitor	25-142 days
	Habitat® (aquatic)	✓		✓	✓	✓		✓	✓	6 pints per acre per year	Dependent upon plant species treated	✓	✓	✓	enzyme inhibitor	25-142 days
Metsulfuron	Escort®	✓	✓					✓	✓	4 ounces per acre per year	Dependent upon plant species treated	✓			ALS inhibitor	7-42 days
Sulfometuron methyl	Oust® XP	✓						✓	✓	8 ounces per acre per year	Dependent upon plant species treated	✓		✓	amino acid inhibitor	30 days
Triclopyr	Garlon 3a	✓	✓					✓	✓	2-3 gallons per acre per year	Dependent upon plant species treated	✓			hormone (auxin) mimic	10-46 days
	Garlon 4 Ultra	✓	✓					✓	✓	Dependent upon plant species treated	Dependent upon plant species treated	✓	✓		hormone (auxin) mimic	10-46 days
	Renovate 3 (aquatic)	✓	✓			✓		✓	✓	Dependent upon plant species treated	Dependent upon plant species treated	✓			photosynthesis inhibitor	< 4 days

*Includes Injection/Cut Stump

Application Methods

Eglin would use the following application methods:

- Manual crew.
- Foliar application (directed foliar application using hand-pump or motorized backpacks).
- Basal bark application.
- Soil spots (basal or grid-pattern).
- Injection (including hack and squirt and the hypo-hatchet), cut-stump, and other ground applications.
- Foliar application (foliar application using spray tanks on vehicles/ATVs/trailers and hoses).
- Broadcast (boomless applicator or spray boom mounted on a tractor, skidder, or other vehicle).
- Strip broadcast applications and aerial applications.
- Helicopter or fixed wing, as allowed by label.

Herbicide applicators conducting herbicide treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator. The INPS applicators would be trained in the proper identification of both INPS and native species. An Eglin AFB Endangered Species Biologist would manage and oversee all herbicide contracts for the control of INPS. Applicators (including contractors and their staff) would be briefed on any potential endangered species concerns before conducting herbicide application activities in endangered species habitat; alternatively, contract clauses will require endangered species coordination. Herbicide labels and instructions would be adhered to during handling, mixing, and application of herbicides.

Global Positioning System (GPS) files, detailed maps and/or ground-marking, or Geographic Information System (GIS) electronic files would be provided to the applicator to delineate the areas to be treated and places to avoid. For aerial applications, the aircraft would be required to use GPS. The aircraft GPS would be used to determine aerial herbicide application location, pattern, and rate. The aircraft would use a single-pass pattern with no overlap. The applicator would be required to use the Air Force's GPS and GIS electronic files to determine treatment areas and coordinate with the Air Force to ensure compatibility (projection and coordinate system) of the electronic files with the aircraft GPS. Due to range and air space operations, aerial application requires special approval and coordination with the Range Air Space Schedulers, Range Operations and Control Center (ROCC), and Air Traffic Control Tower. Aerial herbicide application scheduling would be done through the Range/Range Air Space Schedulers to deconflict and schedule dates/times for air and ground operations. Crews would maintain contact at all times with the ROCC when working in a restricted area. Sensitive areas would not receive herbicide (unless it has a water label). These areas would be digitized with GPS or GIS and provided to the applicator. Sensitive areas include water bodies, areas adjacent to water bodies, sites without vegetation, and certain sensitive habitats as determined by the

Eglin NRS. Areas to be avoided due to concerns for T&E species would be identified through coordination with endangered species biologists and consultation with the USFWS.

Management Requirements for Herbicide Applications

Eglin AFB personnel would protect the environment during mixing, loading, application, and disposal of herbicides to minimize adverse impacts. Herbicides would not be applied if winds create drift outside the treatment area (generally greater than 10 miles per hour [mph]) or to water saturated soils (unless it is labeled for such use). A spill kit capable of containing and preventing release of these chemicals into adjacent water sources would be available during mixing and loading operations. Water tanks/trucks would be required to obtain water for herbicide mixes, to eliminate the possibility of backflow contamination. Empty containers would be recycled or disposed of in accordance with (IAW) Florida State pesticide and hazardous material laws. Pesticide application would be recorded by Forest Management personnel at Eglin Natural Resources on DD Form 1532-1 and a copy forwarded to 96th Civil Engineer Squadron, Pest Management (96 CES/CEOUE) within one week of application. Records would include date of application, acres treated, target vegetation, application method, name of applicator, Florida State Certification number, herbicide name (trade and active ingredient), USEPA Registration Number, concentration of final mixture (%), total volume applied, wind speed, and direction. Proper coordination with air traffic control and/or range management personnel would also be arranged to ensure safety. Contract applicators may need to obtain Department of Defense (DoD) clearance to land on and treat areas at the Eglin Range.

During the planning process, Eglin would consider the objectives of the proposed activity and impacts of actions that may disturb the soil surface or impact water quality. Planners would help identify sensitive areas and applicable avoidance and minimization measures to be used during herbicide applications. The Eglin NRS would help identify terms and conditions of a written contract. Eglin would maintain written records of any natural resources management activity on the land. Plans would consider:

- Current and past land use, such well sites, human occupation, and outdoor recreation.
- Sensitive areas such as perennial and intermittent streams, ephemeral streams or ponds, lakes, ponds, bays, wetlands, steep slopes, highly erosive or hydric soils, active gully systems, etc.
- Regulations and/or permitting requirements.
- Location, type, timing and logistics of each activity.

In addition to the procedures detailed above and in the Application Methods subsection, the following requirements also would be implemented as part of the Proposed Action:

- Employ a general 300-foot buffer zone around surface waters, wetlands, and floodplains (unless using an herbicide labeled for water use), or determine the soil erodibility, slope, and surface water width of a particular area and use that information along with the Florida State Division of Forestry Silviculture Best Management Practices Handbook (Appendix F) to create a smaller buffer zone (minimum 35 feet) as appropriate in areas

with lower soil erodibility and slope—**only if the buffer is not already predetermined by a sensitive species or habitat**.

- Evaluate weather conditions (e.g., temperature, wind speed, and precipitation), equipment capabilities, and pesticide formulations to avoid pesticide drift into the buffer zone.
- Avoid application of a pesticide directly to water bodies (streams, lakes, and swamps) unless it is specifically prescribed and labeled for aquatic management.
- Avoid broadcast applications of herbicides within the 300-foot buffer zone around water bodies (unless it is aquatic-labeled).
- Aerial applications should be made when wind speed is less than 10 miles per hour.
- Time the application of herbicides to avoid upcoming rain events.
- Conduct on-site pesticide handling away from streams, ponds, wells, and roadside ditches, such as tank mixing, loading and rinsing equipment.
- Dispose of or recycle pesticide containers and/or excess pesticides according to local, state, and federal regulations and label requirements.
- Clean up and/or contain any pesticide spill immediately.
- Where available, check reports of depth to groundwater and avoid application of herbicides to test areas having shallow [10 feet below surface] groundwater).
- Herbicide applications would not occur within 1,500 feet of ponds and sampling points located within Florida Natural Areas Inventory (FNAI) Category 1 (habitat known to support flatwoods salamanders) or FNAI Category 2 (habitat with a strong potential to support flatwoods salamanders) areas. The Natural Resources Section would provide maps showing these areas to applicators.
- Applications of herbicides would not occur within 300 feet of known dusky gopher frog habitat or known Florida bog frog habitat.
- A 300-foot buffer would be required for nonaquatic labeled herbicides which are toxic to fish and/or herbicides which are highly mobile and have the potential to contaminate groundwater around designated Gulf sturgeon critical habitat and Okaloosa darter streams.
- Direct application of herbicides to water would be prohibited around designated Gulf sturgeon critical habitat and in Okaloosa darter streams.
- Herbicide applications would not occur within 1,500 feet of the bald eagle nest site during the breeding season (1 October through 15 May).
- In the event of ground application of herbicides within an RCW cluster using mechanized equipment, operations would not occur during the RCW nesting season.
- In the event of manual application of herbicides within an RCW cluster, procedures outlined in the consultation for "Hexazinone Application on Interstitial Areas" (September 25, 2001) would be followed or further coordination with the Service would take place.

- Aerial applications of herbicides that are known to cause eye damage would be prohibited—only ground applications of these herbicides would be permitted.
- Any treatments in outstanding natural areas (ONAs), significant botanical sites (SBSs), or high quality natural communities (HQNCs) or near aquatic preserves, Gulf sturgeon critical habitat, or essential fish habitat (EFH) would require approval from Eglin Forestry Management NRS, including specifics on application method, herbicide type, buffers, and timing.
- For areas used by recreationists or other persons, post signs at the entrances of areas to be treated containing the reason, time, and duration of closure.
- Schedule herbicide application so that herbicides to minimize impacts to hunting.

Eglin would monitor vegetative response in treated areas. Application sites would be inspected within two to three weeks (sometimes after a rain depending on how the herbicide works). The following data would be collected:

- Date of herbicide application.
- What herbicide was used.
- Where herbicide was applied.
- What application method was used.
- How much herbicide was used.
- What was the vegetative response to the herbicide in the treated area?
  - Did it eliminate target species?
  - Were other non-target species enhanced or harmed?

2.2 ACTION ALTERNATIVES

2.2.1 Alternative 1

Under Alternative 1, minimum vegetation management would be accomplished for test area maintenance and habitat management for T&E species. The number of acres treated, intensity, and frequency of treatments would be reduced from the preferred alternative. All of the aquatic labeled herbicides listed above for the preferred alternative would be eliminated. Alternative 1 would allow increased use of a variety of herbicides on sandhills habitat above current levels, but continue to restrict the use of chemicals near aquatic habitats such as streams, wetlands, and ponds. Without aquatic-labeled chemicals, Eglin would not be able to treat many portions of test areas and interstitial areas.

The following chemicals would be allowed under Alternative 1:

Common Name	**Example Trade Name**
Aminopyralid	Milestone
Fluroxypyr	Vista

Common Name	Example Trade Name
Fosamine	Krenite
Glyphosate	Accord XRT
Imazapic	Plateau
Imazapyr	Arsenal
Imazapyr	Chopper
Metsulfuron	Escort
Sulfometuron methyl	Oust XP
Triclopyr	Garlon 3a
	Garlon 4

Table 2-6 above identifies the target species, application methods, and chemical properties of the proposed herbicides. Table 2-7 above lists environmental hazards and associated mitigations (or management requirements) for each herbicide. The proposed chemicals for Alternative 1 would not include aquatic labeled forms of herbicides.

Due to the presence of UXO, several test areas are inaccessible by ground crews and equipment; those test areas require aerial herbicide treatments. Additionally, aerial application of herbicides is often the only practical measure for large area control of undesirable vegetation when the window of opportunity for application is small or the large acreage is unmanageable by ground control techniques. Many test areas that need aerial applications contain isolated wetlands, streams, and ponds. Without aquatic label herbicides, large areas on Eglin would not be treated and mission impacts could occur.

2.2.2 No Action Alternative

Under the No Action Alternative, mowing and bush hogging/roller-drum chopping would continue on an estimated 27,000 acres of test area lands every two years. Vegetation growth would continue to obstruct some LOS, new areas would be obstructed, and it would not be possible to conduct certain testing that requires cleared areas. The NRS would continue to use hexazinone in sandhills for RCW and ecosystem restoration, but it would not be possible to use it in other habitat types. Erosion from drum-chopped areas would continue to put sediment in multiple stream systems on Eglin, including some Okaloosa darter streams. The Test Area Maintenance Programmatic Environmental Assessment (U.S. Air Force, 1999), Test Area Maintenance Environmental Baseline Document (U.S. Air Force, 2006), and the individual Test Area Maintenance Plans (referred to in Section 1.4 above) provide additional information on current vegetation management techniques.

2.3 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

The Air Force examined several alternatives to the Proposed Action. Alternatives that met minimum criteria were considered suitable for detailed analysis. The selection criteria were: 1) conformance to existing laws and Air Force policy, the Eglin AFB Integrated Natural Resources Management Plan (U.S. Air Force, 2006a) and the Pest Management Plan for Eglin AFB (U.S. Air Force, 2005e); 2) techniques that provided adequate control of unwanted vegetation; 3) techniques that were fiscally acceptable from a socioeconomic standpoint; and 4) techniques that minimize down time (i.e., times military training cannot be conducted) on the test areas, and prescriptions that maximize mission-attainment of the test ranges, and techniques that maximize the windows of opportunity for treatment during the course of the year.

Eliminating the use of prescribed fire was considered, but dismissed as a viable alternative. Prescribed fire is needed to maintain and improve ecological conditions, and habitats for T&E species, such as the RCW. Prescribed fire is also the only practical method Eglin AFB has to minimize risk of destructive wildfires. Eliminating prescribed fire would not meet the objective.

Use of only mechanical, prescribed fire and ground application of herbicides was considered but not carried forward as an alternative. UXO limits the use of ground equipment at several test areas. Control of undesirable vegetation using only mechanical or ground application of herbicides and burning is more costly than aerial application. Equipment and work force requirements are high, and may not be available or may be too costly. Aerial application of herbicides is often the only method available for large area control of undesirable vegetation when the window of opportunity for application is small; it is the only method that can be used when the area is unmanageable by ground control techniques.

2.4 COMPARISON OF ALTERNATIVES

Table 2-8 provides a comparison of alternatives.

Table 2-8. Summary of Issues, Proposed Action and Alternatives, and Potential Impacts

Resource Area	Proposed Action	Alternative 1	No Action Alternative
Soils	There would be no significant negative impacts. Pesticide spills would be cleaned up and/or contained immediately. Disposal of pesticide containers and/or excess pesticides would be done according to local, state, and federal regulations and label requirements.	There would be no significant negative impacts. Same as Proposed Action.	There would be substantial impacts. Soils would continue to be disturbed by bush hogging and roller-drum chopping activities, causing erosion issues.

Table 2-8. Summary of Issues, Proposed Action and Alternatives, and Potential Impacts Cont'd

Resource Area	Proposed Action	Alternative 1	No Action Alternative
Water Resources	There would be no significant negative impacts. Buffer zones would be established along perennial and intermittent streams, standing water and flowing bodies of water. No herbicide would be applied directly to water bodies unless it is specifically prescribed and labeled for aquatic management. There would be no broadcast applications of herbicides within the buffer zones (if not labeled for aquatic use).	There would be no significant negative impacts. Buffer zones would be established. No herbicides would be applied directly to water bodies. There would be no broadcast applications of herbicides within the Buffer zones.	There would be substantial impacts. Soil erosion issues caused by bush hogging and roller-drum chopping would continue to create sedimentation and pollution issues in surface waters.
Air Quality	There would be no significant negative impacts. Based on criteria selected (10-percent exceedence of Okaloosa, Santa Rosa and Walton County Air Emissions), Eglin does not anticipate any adverse impacts to air quality. Herbicides would not be applied if winds create drift outside the treatment area (generally less than 10 mph).	There would be no significant negative impacts. Same as Proposed Action.	There would be no significant negative impacts. Due to areas of excessive vegetation, growth that cannot be maintained by current practices, munitions-caused wildfires would become more frequent, and possibly bigger. These wildfires would cause smoke related air quality impacts.
Biological Resources	There would be no significant negative impacts. Herbicides used judiciously would help improve the ecological condition of Eglin habitats through the extermination of non-native and undesirable plant species. Buffer zones would be established around known T&E species areas to reduce the chances of negatively affecting those populations.	There would be no significant negative impacts. Same as Proposed Action.	There would be substantial impacts. Some areas of invasive plant species cannot be controlled with currently approved methods. If these plants are allowed to multiply at the current rate, this would degrade T&E species habitat and other sensitive habitats.
Socioeconomic Resources	There would be no significant negative impacts. There would be a decrease in the amount of bush hogging and roller-drum chopping, reducing the demand for these operators. However, these workers would be employed performing other range maintenance activities, further enhancing the ecological and monetary value of Eglin AFB.	There would be no significant negative impacts. Same as Proposed Action.	There would be substantial negative impacts. Vegetation on some test areas is unmanageable under present methods, causing them to become unusable. If test areas are not able to be utilized due to loss of LOS and mission capabilities, organizations that make use of these areas would have to find new testing methods or relocate to a different military installation. If an organization relocated, it would mean a loss of jobs, which could impact the local economy.

Table 2-8. Summary of Issues, Proposed Action and Alternatives, and Potential Impacts Cont'd

Resource Area	Proposed Action	Alternative 1	No Action Alternative
Safety	There would be no significant negative impacts. Herbicides would be handled per the label instructions and application would occur in accordance with label requirements by a State of Florida certified applicator. Proper safety measures would also be observed in the operation of the delivery and application vehicles (i.e., helicopter, ground vehicles.)	No significant negative impacts. Same as Proposed Action.	No impacts would occur.
Environmental Justice and Risks to Children	There would be no significant negative impacts. Herbicides would not be applied if winds create drift outside the treatment area (generally less than 10 mph). Application of herbicides would occur in accordance with label requirements by a State of Florida certified applicator.	No significant negative impacts. Same as Proposed Action.	No impacts would occur.

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3. AFFECTED ENVIRONMENT

3.1 SOILS

3.1.1 Definition of the Affected Resource

The majority of Eglin AFB is located primarily within the Coastal Lowland physiographic province. The northern portion of Eglin is located within the Western Highlands province. These physiographic zones are products of geology, terrain, slope, and stages of erosion development (Becker et al., 1989). Eglin also has a diversity of soil types with unique physical and chemical characteristics that, combined with a subtropical climate, partly determines the structure and function of these areas' unique ecosystems.

Soil formation is a continual process that is ultimately determined by the parent geologic material and influence of factors such as climate, topography, and vegetation. The susceptibility of the soil to erosion depends on several factors including, but not limited to, soil texture, saturation point, and slope. Soil erodibility generally decreases with increasing clay and organic matter content, whereas uniform silts and sands tend to have high soil erodibility. Lakeland Sand soil is moderately susceptible to erosion due to its high sand content. In areas where the soils are more organic matter and clay, there is a smaller chance of severe erosion (Overing and Watts, 1989; Overing et al., 1995). Vegetation also plays a critical role in reducing erosion. Areas of Eglin AFB, where woodland stands are maintained, have slight erosion potential for most soil series. Unvegetated areas have a higher susceptibility to soil erosion from water and wind.

Overall, the majority (>80 percent) of soils on Eglin AFB are sandy soils that are low in organic matter. Soil texture is defined by the relative proportion of sand, silt, and clay present in the soil. Sand grains range from 0.05 to 2 millimeters (mm) in diameter, silt particles 0.002 to 0.05 mm, and clays < 0.002 mm. The manner in which these mineral grains of different size and shape are packed together determines the soil pore system. Large pores are essential for air flow supplying oxygen for root and microbial growth. Small pores retain water for plant use. Sandy soils have low porosity (about 42 percent) even though the average size of the pores is large (Overing et al., 1995).

Permeability ratings are moderate to very rapid (6.0 to 20 inches per hour) for the Lakeland sands and slow to moderate (0.6 to 6.0 inches per hour) for the soils such as Dorovan-Pamlico (Table 3-1). Soil permeability is measured as the inches per hour that water moves downward through a saturated soil. The rate of infiltration reflects matrix and gravitational forces. Sandy soils have higher rates of permeability because of the larger sized pores; gravity also influences the rate of flow in these soils. Fine textured soils wet slowly because they have a low hydraulic conductivity even when saturated (Overing et al., 1995). Hydraulic conductivity is the ease with which water can move through pore spaces in the soil.

Table 3-1. Soil Types Summary for Eglin AFB

Soil Name	Acres	% Coverage of Eglin AFB
Lakeland Sand	334,497	72.13
Dorovan and Pamlico Soils	39,236	8.46
Troup, Orangeburg and Cowarts Soils	29,264	6.31
Chipley and Hurricane Sands	12,077	2.60
Bonneau, Norfolk and Angie Soils	10,269	2.21
Pickney and Rutledge Sands	10,217	2.20
Kinston, Johnson and Bibb Soils	8,258	1.78
Foxworth Sand	7,107	1.53
Albany and Pactolus Sands	6,163	1.33
Newhan-Corolla Complex	4,102	.88
Eglin Sand	1,442	.31
Udorthents	684	.15
Remaining soil types	426	.09

3.1.2 Existing Condition

There are over 30 soil types on Eglin AFB. The most abundant type of soil on Eglin is the Lakeland Soil Series. The second most abundant soil type is the Dorovan-Pamlico Association. These two soil series comprise over 80 percent of the soils on Eglin (Figure 3-1).

The majority of soils belong to the Lakeland association, which are primarily excessively drained, brownish-yellow sands that have developed along the broad ridge tops and slopes. Slopes of the Lakeland association can range from zero to 30 percent. Typically, these soils have sandy upper horizons and sandy subsoils that are more than 80 inches deep (Overing et al., 1995). Lakeland soils comprise 72 percent of Eglin land reservation and underlay the Sandhills ecological association, the largest ecological association on the base, and the Open Grassland/Shrubland, Sand Pine, Flatwoods, and Swamp associations. Lakeland soils are associated with Chipley, Dorovan, Foxworth, Lucy and Troup soils. Only the Dorovan soils have high organic content denoting them as mucks. Lakeland sands vary in acidity from medium to very strong. Soil colors in these sands range from dark, grayish brown to brownish-yellow to yellowish-brown (Overing and Watts, 1989; Overing et al., 1995).

After Lakeland sand, the most commonly occurring soil type is the Dorovan-Pamlico Association soils. These soils are very poorly drained, nearly level, deep mucky soils that are underlain with sandy material. Dorovan-Pamlico mucks are typically found along drainages such as the Yellow River, Rocky Creek, and Turkey Creek. Mucks are composed of soils of more than 20 percent organic matter that is highly decomposed. Water is usually at or near the surface for nine months or more each year. About 60 percent of this association is made up of Dorovan soils, which have organic material more than 40 inches deep over sand. The Pamlico soils make up about 25 percent of the association and have soils that are 20 to 40 inches deep.

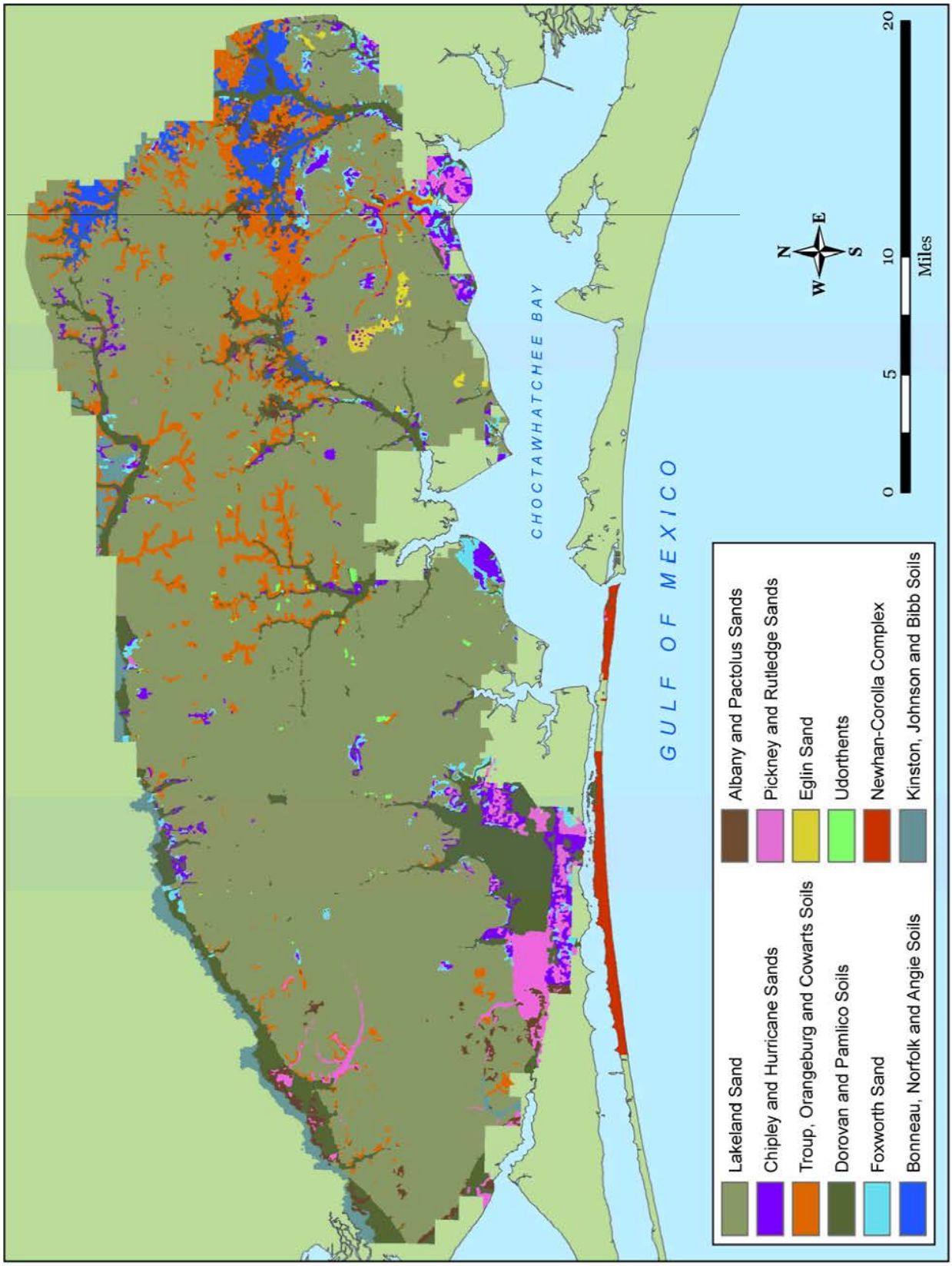

Figure 3-1. Major Soil Types on Eglin AFB

Other riverine environment soils may include soil associations such as the Bonifay-Troup-Dothan association. These are well-drained loamy sands to clay loams found within the upper reaches of the streams and in portions of some test areas such as C-74, C-72, and C-52. These soils have slopes of zero to eight percent (Overing and Watts, 1989; Overing et al., 1995).

Though herbicides are targeted at plants, the soil by extension is a major receptor of the applied herbicide as well. Persistence of the herbicide depends on several factors, including the chemical property of the ingredients, soil properties, and weather. Other factors serve to affect persistence of these chemicals in the environment. Herbicides may break down more rapidly due to high heat and humidity environments, such as that which Florida experiences every year. Soils high in clay and organic material and low in pH (Potential of Hydrogen (a measure of acidity)) serve to prevent leaching and promote absorption. Rainfall amounts also assist in transportation of the herbicide by facilitating movement through the soil or by runoff (USDAFS, 1994).

3.2 WATER RESOURCES

This section provides definitions of water resources for Eglin AFB. Water Resources include groundwater, surface water, wetlands and floodplains.

3.2.1 Definition of the Affected Resource

Groundwater

The two aquifers located under Eglin are the Sand and Gravel Aquifer and the Floridan Aquifer. Eglin uses only a small amount of water from the Sand and Gravel Aquifer; however, the Floridan Aquifer is used extensively. The Floridan Aquifer is located below the Sand and Gravel Aquifer and extends beneath peninsular Florida.

Sand and Gravel Aquifer

The Sand and Gravel Aquifer consists of the Citronelle formation and marine terrace deposits. Although the aquifer is composed of clean, fine-to-coarse sand and gravel, locally it contains some silt, silty-clay, and peat beds. The Sand and Gravel Aquifer is segregated from the underlying limestone of the Floridan Aquifer by the Pensacola Clay confining bed. Water in the Sand and Gravel Aquifer exists in generally unconfined (a free water surface or water table conditions) and confined (under pressure) conditions (Becker et al., 1989). FDEP has rated the quality of water in the aquifer as "good," which means it meets its intended use (U.S. Air Force, 1995).

Floridan Aquifer

The Floridan Aquifer consists of a thick sequence of interbedded limestone and dolomite. Throughout the Eglin reservation, the Floridan Aquifer exists under confined conditions, bounded above and below by the Pensacola Clay Formation confining bed. This clay layer restricts the downward migration of pollutants and restricts saline water from Choctawhatchee Bay and the Gulf of Mexico from entering the upper limestone layer of the aquifer. The clay

layer of the Bucatunna Formation separates the upper and lower limestone units. Since this layer has a high saline content, the lower limestone unit is not used as a water source (USDA, 1995). Groundwater storage and movement in the upper limestone layer occurs in interconnected, intergranular pore spaces, small solution fissures, and larger solution channels and cavities.

Surface Water

Surface waters are hydrological features such as bays, bayous, lakes, rivers, streams, ponds, and springs. Water quality of surface waters can be impacted by land clearing, construction/demolition activities, and polluted stormwater runoff.

Surface Water Quality

The state of Florida has developed and retains jurisdiction for surface water quality standards for all waters of the state in accordance with the provisions of the Clean Water Act. Section 303 of the Clean Water Act requires the state to establish water quality standards for waterways, identify those that fail to meet the standards, and take action to clean up these waterways. Florida recently adopted the Impaired Waters Rule (Chapter 62-303, FAC), with amendments, as the new methodology for assessing the state's waters for 303(d) listing. The FDEP submits names of surface waters that are determined to be impaired using the methodology in the Impaired Water Rule and adopted by secretarial order to the USEPA for approval as Florida's 303(d) list. The FDEP submits updates to Florida's 303(d) List of Impaired Surface Waters to the USEPA every two years. The 2006 Integrated Water Quality Assessment for Florida: 2006 305(b) Report and 303(d) List Update (FDEP, 2006) satisfies the listing and reporting requirements of Sections 303(d) and 305(b) of the Clean Water Act (CWA). The FDEP divides river basins across Florida into five groups, which the agency addresses according to an established rotation schedule. Choctawhatchee-St. Andrews Bay Basin is Group 3, and Group 4 includes the Pensacola Bay Basin (FDEP, 2006).

Wetlands

Wetlands are areas of transition between terrestrial and aquatic systems where the water table is usually at or near the surface. Conversely, these can occur where shallow water covers land (USFWS, 1979). Abiotic and biotic environmental factors such as morphology, hydrology, water chemistry, soil characteristics, and vegetation contribute to the diversity of wetland community types. The term *wetlands* describe marshes, swamps, bogs, and other similar areas. Local hydrology and soil saturation largely affects soil formation and development as well as the plant and animal communities found in wetland areas (USEPA, 1995). One of the most important factors in establishing and maintaining wetland processes is wetland hydrology (Mitsch, 2000).

Wetlands are defined in the U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE, 1987). The majority of jurisdictional wetlands in the United States are described using the three wetland delineation criteria: hydrophytic vegetation, hydric soils, and hydrology (USACE, 1987).

Cowardin et al. (1979) classifies wetlands into one of five categories:

Estuarine – Deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, with ocean water at least occasionally diluted by freshwater runoff from the land. The upstream and landward limit is where ocean-derived salts measure less than 0.5 parts per thousand (ppt) during the period of average annual low flow. The seaward limit is (1) an imaginary line closing the mouth of a river, bay, or sound or (2) the seaward limit of wetland emergents, shrubs, or trees when not included in (1).

Riverine – All wetlands and deepwater habitats contained within a channel except those wetlands (1) dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens and (2) which have habitats with ocean-derived salinities in excess of 0.5 ppt.

Lacustrine – Wetlands and deepwater habitats (1) situated in a topographic depression or dammed river channel, (2) lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30 percent area coverage, and (3) whose total area exceeds 8 hectares (20 acres) or is less than 8 hectares if the boundary is active-wave-formed or bedrock or if water depth in the deepest part of the basin exceeds 2 meters (6.6 feet) at low water. Ocean-derived salinities are always less than 0.5 ppt.

Palustrine – All nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens and all such tidal wetlands where ocean-derived salinities are below 0.5 ppt. This category also includes wetlands lacking such vegetation but with all of the following characteristics: (1) area less than 8 hectares, (2) lacking an active-wave-formed or bedrock boundary, (3) water depth in the deepest part of the basin less than 2 meters (m) (6.6 feet [ft]) at low water, and (4) ocean-derived salinities less than 0.5 ppt.

Marine – Open ocean overlying the continental shelf and coastline exposed to waves and currents of the open ocean shoreward to (1) extreme high water of spring tides, (2) seaward limit of wetland emergents, trees, or shrubs, or (3) the seaward limit of the Estuarine System, other than vegetation. Salinities exceed 30 ppt (U.S. Air Force, 2006).

Wetland Regulations

The USACE is the lead agency in protecting wetland resources. This agency maintains jurisdiction over federal wetlands (33 CFR 328.3) under Section 404 of the CWA (30 CFR 330) and Section 10 of the Rivers and Harbors Act (30 CFR 329). The USEPA assists the USACE (in an administrative capacity) in the protection of wetlands (40 CFR 225.1 to 233.71). The state of Florida regulates wetlands under the Wetlands/Environmental Resource Permit program under Part IV, Florida Statutes Section 373. Furthermore, EO 11990, Protection of Wetlands, offers additional protection to these resources. In addition, the USFWS and the National Marine Fisheries Service (NMFS) have important advisory roles. The FDEP's Chapter 62-312, Dredge and Fill Program, affords regulatory protection to wetland resources at the state level. This agency issues a Section 401 certification under the authority of the Clean Water Act (40 CFR 230.10[b]).

Floodplains

Floodplains are lowland areas adjacent to surface water bodies (i.e., lakes, wetlands, and rivers), where flooding events periodically cover flat areas with water. Floodplains are biologically unique and highly diverse ecosystems providing a rich diversity of aquatic and terrestrial species, acting as a functional part of natural systems (Mitsch, 2000). Vegetation and soils act as water filters, intercepting surface water runoff before it reaches lakes, streams, or rivers and stores floodwaters during flood events. This filtration process aids in the removal of excess nutrients, pollutants, and sediments from the water and helps reduce the need for costly cleanups and sediment removal. Conversely, if soils and sediments are contaminated, these contaminants can then be deposited on floodplains.

Floodplains Regulations

Federal agencies must evaluate any actions considered to determine whether they would occur within a floodplain. Agencies must consider those areas with a one percent chance of floodwater inundation in a given year (also known as a 100-year floodplain). EO 11988, Floodplain Management, requires federal agencies to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid floodplain development whenever possible. Parts of the floodplain that are also wetlands receive further protection under the USACE's Section 404 Permit Program.

Coastal Zone Management Act (CZMA)

The state of Florida defines the landward boundaries of the state, in accordance with Section 306(d)(2)(A) of the CZMA, as the entire state of Florida. Federal agency activities potentially impacting the coastal zone are required to be consistent, to the maximum extent practicable, with approved state coastal zone management programs. Federal agencies make determinations as to whether their actions are consistent with approved state plans. Eglin AFB submits consistency determinations to the state for review and concurrence. All relevant state agencies must review the Proposed Action and issue a consistency determination. The Florida Coastal Management Program is composed of 23 Florida statutes, administered by 11 state agencies and 4 of the 5 water management districts. Any components of the Proposed Action or Alternative 1 that take place within the jurisdictional concerns of the state would require a consistency determination with respect to Florida's Coastal Management Plan.

3.2.2 Existing Condition

This section describes the qualitative and quantitative characteristics (existing conditions) of water resources defined in Section 3.2.1, Definition of the Affected Resource.

Groundwater

Water from the Sand and Gravel Aquifer is not a primary source of domestic or public water supply on Eglin because of the large quantities of higher quality water available from the underlying Upper Limestone of the Floridan Aquifer (Becker et al., 1989; USDA, 1995). The quality of the water drawn from the upper limestone of the Floridan aquifer is suitable for most uses and is the primary source of water used at Eglin AFB. On Eglin, wells that draw from the

Floridan Aquifer provide both for potable and nonpotable needs, while the Sand and Gravel Aquifer provides only for nonpotable water uses.

Surface Water

Surface water on Eglin AFB includes 32 lakes (over 300 acres of man-made ponds and natural lakes), 30 miles of rivers, an extensive stream network covering approximately 600 acres of the base, and several estuarine bays along the Gulf of Mexico (Figure 3-2).

Most of the streams on Eglin are classified as seepage streams or blackwater streams. One spring-fed stream, Blue Spring Creek in Okaloosa County, originates from a deep artesian spring. Seepage streams are clear to lightly-colored, relatively short, shallow, and narrow water courses originating from shallow groundwater that has percolated through deep, sandy, upland soils. Unique types of seepage streams, called *steephead streams*, are characterized by steep slopes terminating in amphitheater-like ravines where the spring flow originates. Blackwater streams are steep-banked streams that characteristically have tea-colored waters laden with tannins, particulates, and dissolved organic matter and iron from swamps and marshes that feed into the streams.

Many of the ponds on Eglin are man-made, resulting from the backup of water behind small dams built on streams. Natural ponds and wetlands are also found on Eglin and are usually relatively small. These ponds/wetlands range from holding water permanently to only a few weeks a year, and some contain herbaceous or woody vegetation (U.S. Air Force, 2006).

Outstanding Florida Waters

Several water bodies on or adjacent to Eglin have been defined as Outstanding Florida Waters (Florida Administrative Code [FAC] 62-302.700) because they have exceptional recreational or ecological significance. It is the FDEP's policy to afford the highest protection to Outstanding Florida Waters, which are listed below.

- Waters of the Fred Gannon Rocky Bayou State Recreational Area
- Waters of the Basin Bayou State Recreation Area
- Rocky Bayou State Aquatic Preserve
- Yellow River Marsh Aquatic Preserve
- Shoal River

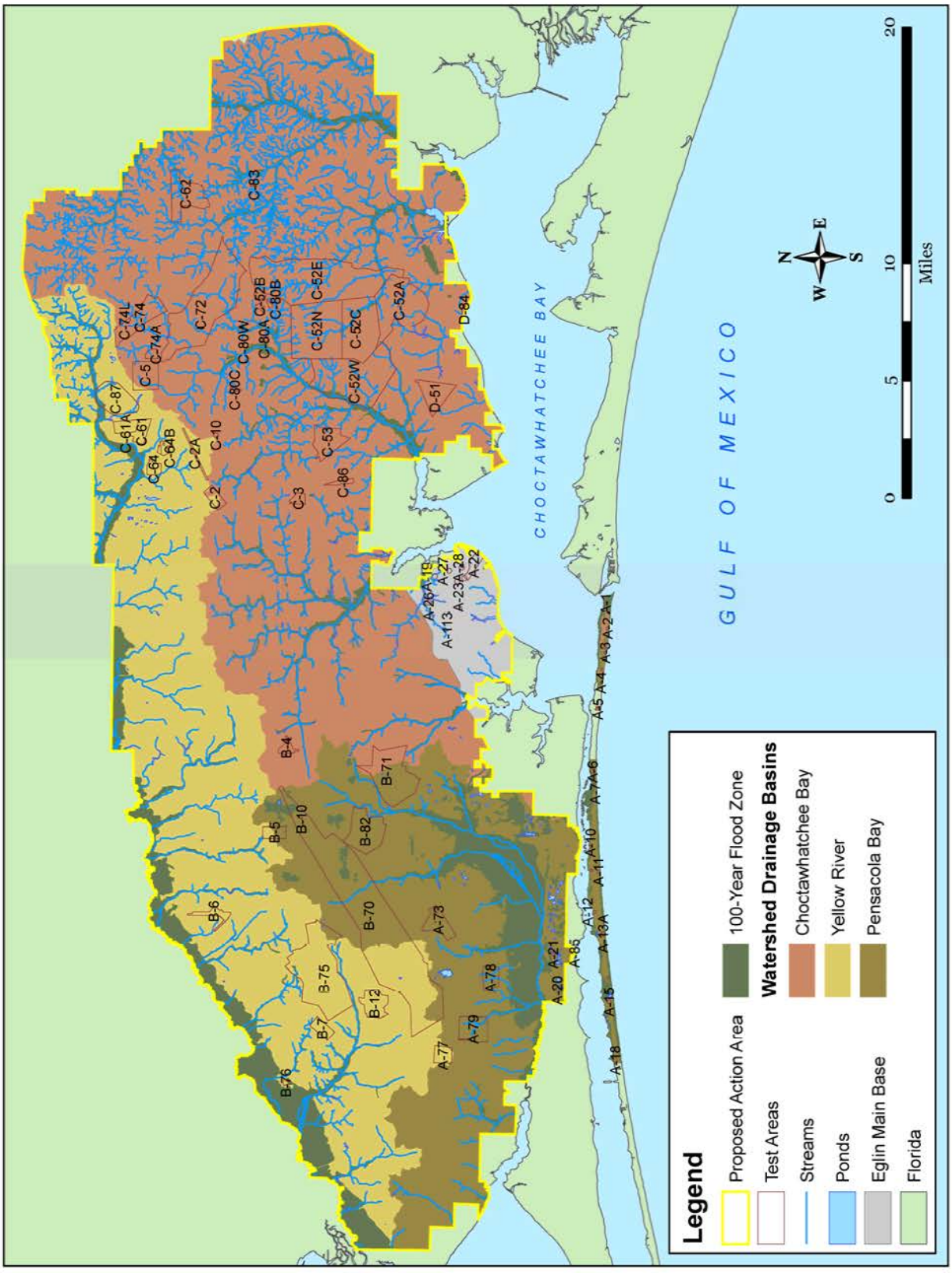

Figure 3-2. Surface Waters

Surface Water Quality

The FDEP divides river basins across Florida into groups, which they address according to an established rotation schedule. The eastern portion of Eglin AFB drains to the Choctawhatchee-St. Andrews Bay Basin (Group 3), and the western side drains to the Pensacola Bay Basin (Group 4) (FDEP, 2006a). The 2006 303(d) List updated the impaired waters list for Group 3 but not Group 4. However in May 2006, the FDEP adopted a Verified List of Impaired Waters for Group 4 Basins and submitted this list to the USEPA. This list amends the Group 4 1998 303(d) List and serves as the FDEP's updated Group 4 303(d) list (FDEP, 2006b).

Water quality within Eglin Reservation is generally good. However, due to water inflow from other areas, some waters within or adjacent to Eglin are classified as impaired on the 303(d) List. Table 3-2 lists these impaired waters.

Table 3-2. Impaired Waters on or Adjacent to Eglin AFB

Water Body	Group	Impairment Parameter
Boggy Bayou	3	Bacteria, exceeds DOH standards
Poquito Bayou	3	Bacteria, exceeds DOH standards
Rocky Bayou	3	Bacteria, exceeds DOH standards
Choctawhatchee Bay	3	Fecal coliform (shellfish harvesting), exceeds SEAS thresholds
Yellow River (lower)	4	Fecal coliform, mercury
Shoal River	4	Fecal coliform, total coliform

Sources: FDEP, 2006; FDEP, 2006a; FDEP, 2006b
DOH = Department of Health; SEAS = Shellfish Environmental Assessment Section

Wetlands

The Eglin Reservation supports an average of about 63,900 acres of wetlands influenced by seasonal fluctuations in direct precipitation, overland or near-surface flow, shallow groundwater, or some combination of these processes (Figure 3-3). While the majority of Eglin's wetlands are in good condition, some are degraded due to fire suppression, invasive non-native species, or erosion of sediment from roadways, old borrow pits and, on a few sites, from test area vegetation maintenance methods on slopes using choppers.

Wetland types and acreage amounts on the Eglin Reservation are shown in Table 3-3. The 96th Civil Engineer Squadron, Environmental Engineering Section (96 CEG/CEVCE) is the established point of contact for regulatory issues involving wetland resources. Any areas recently surveyed for wetlands (and approved by federal/state regulatory agencies) are entered into Eglin's GIS to aid in future land use management.

Table 3-3. Wetland Areas of Eglin AFB Reservation

Wetland Type	Acres*
Estuarine	657.60
Riverine	265.44
Lacustrine	180.37
Palustrine	62,798.13
Marine	0
TOTAL	**63,901.54**

*Total acres, calculated using Eglin GIS data.

Figure 3-3. Wetlands

Floodplains

Figure 3-3 shows the 100-year flood inundation area (areas with a 1 percent chance of being inundated by floodwater in a given year) for the main reservation. The majority of the reservation is above the 100-year flood zone; however, extensive flood-prone areas occur along the Yellow River drainage system and the East Bay Swamp. The perennial streams on Eglin AFB are included within areas that are likely to be inundated by 100-year floods (Figure 3-3).

3.3 AIR QUALITY

3.3.1 Definition of the Affected Resource

Identifying the affected area for an air quality assessment requires knowledge of sources of air emissions, pollutant types, emission rates and release parameters, proximity to other emissions sources, and local conditions. Refer to Appendix A, Air Quality, for review of air quality regulations.

Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The levels of pollutants are generally expressed as concentrations in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). For this air quality analysis, the region of influence centers on Okaloosa, Santa Rosa, and Walton Counties for all alternatives.

3.3.2 Existing Condition

Eglin AFB currently uses mechanical means, as well as prescribed burning, to control vegetation. Emissions generated from prescribed burns and pesticide application are calculated and reported annually in the Eglin AFB Air Emissions Inventory (Table 3-4). Prescribed or controlled burns are not included as a regulated source under Eglin AFB's Title V permit and are considered an unregulated emissions source. Unregulated sources must be included in the annual report required by the FDEP. Pesticide application is considered insignificant and is not listed as a regulated source in the Title V permit. Pollutant emissions from pesticide/herbicide use were reported for VOCs, ODSs, HAPs, and PM_{10}. The volatile pollutants were associated with the solvent-based liquid pesticides and usually served as the carrier solution for the pesticide ingredient. Particulates were associated with the spray application of the product (U.S. Air Force, 2006c).

Table 3-4. Eglin AFB Baseline Emissions CY2005

Emission Source	Emissions (tons)							
	CO	NO_x	HAP	ODSs	Pb	PM_{10}	SO_x	VOCs
CY2005 Emissions	82.93	138.43	10.56	1.85	0.00	258.80	4.76	103.06
Prescribed Burn	35,068	755	0.00	0.00	0.00	3,849	0.00	7.12
Pesticide/Herbicide/ Insecticide Application	0.00	0.00	0.071	5.6E-4	0.00	1.015	0.00	0.368

Source: U.S. Air Force, 2006c
CO = Carbon Monoxide; NO_x = Nitrogen Oxides (NO_2); HAP = Hazardous Air Pollutants; ODSs = Ozone Depleting Substances; Pb = Lead; PM_{10} = Particulate Matter $\leq$ 10 microns; SO_x = Sulfur Oxides (SO_2); VOCs = Volatile Organic Compounds

The baseline standards for pollutant concentrations are the National Ambient Air Quality Standards (NAAQS) and state air quality standards. These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare. Further discussion of the NAAQS and state air quality standards are included in Appendix A.

The emissions sources analyzed for the Proposed Action include aerial herbicide application and prescribed burn of treated areas. The primary concerns are spray drift during herbicide application to areas off-target that may affect plants, animals, and humans adversely and the emissions of hazardous air pollutants or toxic emissions when treated areas are burned.

3.4 BIOLOGICAL RESOURCES

3.4.1 Definition of the Affected Resource

Flora and Fauna

Eglin AFB applies a classification system of ecological associations to its lands, based on floral, faunal, and geophysical characteristics. Descriptions of these ecological associations are available in Eglin's *Integrated Natural Resources Management Plan* (U.S. Air Force, 2006a) and the *Environmental Baseline Study Resource Appendices* (U.S. Air Force, 2003).

Four broad matrix ecosystems exist on Eglin AFB: Sandhills, Flatwoods, Wetlands/Riparian, and Barrier Island. Three of these are located within the range of influence for Long-term Vegetation Control actions and are described below. Because no activities are proposed for Santa Rosa Island, the Barrier Island ecological association is not shown in any maps and no description is provided. Artificially maintained open grasslands/shrublands and urban/landscaped areas also exist on Eglin, primarily on test areas and Main Base. Although grasslands/shrublands and urban/landscaped areas are not true ecological associations, they are included as land uses.

Sandhills Matrix

Longleaf Pine Sandhills are characterized by an open, savanna-like structure with a moderate to tall canopy of longleaf pine, a sparse midstory of oaks and other hardwoods, and a diverse

groundcover composed mainly of grasses, forbs, and low shrubs. The structure and composition was maintained by frequent fires, (every three to five years), which controlled hardwood, sand pine, and titi encroachment. Longleaf Pine Sandhills consist of a high diversity of species adapted to fire and the heterogeneous conditions that fires create. Variation within the Sandhills is recognized by the two associations differing in the dominance of grass species (wiregrass versus bluestem). Sandhills are often associated with and grade into Scrub, Upland Pine Forest, Xeric Hammock, or slope forests. It is also known as longleaf pine turkey oak, longleaf pine-xerophytic oak, longleaf pine-deciduous oak, or high pine (U.S. Air Force, 2006a).

Flatwoods Matrix

Pine flatwoods occur on flat, moderately well-drained sandy soils with varying levels of organic matter, often underlaid by a hard pan. While the canopy consists of slash pine and longleaf pine, the understory varies greatly from shrubby to an open diverse understory of grasses and herbs. The primary environmental factors controlling vegetation type are soil moisture (soil type and depth to groundwater) and fire history. The average fire frequency in flatwoods is one to eight years, with nearly all of the plants and animals inhabiting this community adapted to recurrent fires. Home to numerous rare and endangered plants and animals, the Flatwoods Matrix plays a significant role in maintaining regional biodiversity (U.S. Air Force, 2006a).

Wetlands/Riparian Matrix

Wetlands are extraordinarily important contributors to the health and diversity of the Eglin landscape. Riparian areas are generally found along a water feature such as a river, stream, or creek. A great diversity of invertebrate and fish species is found within the streams associated with these watersheds. At least 11 different plant community types are found within riparian areas of the Eglin Range. Streams are perennial, originating in the sandy uplands of the installation and fed by groundwater recharge. Flood events only occur during extreme rain events (e.g., hurricanes), otherwise flows are relatively constant. Temperatures fluctuate during the year and each day, being more constant near the headwaters. These seepage streams are moderately acidic. The specific types of wetlands/riparian matrices found on or adjacent to the Eglin Range are depression wetlands, seepage slopes, floodplain wetlands, seepage streams, spring-fed streams, blackwater streams, and alluvial rivers (U.S. Air Force, 2006a).

Open Grasslands/Shrublands

Open grasslands/shrublands occur in areas of heavily disturbed Sandhills, Flatwoods, and Wetlands/Riparian ecological sites. This habitat predominantly occurs within the test areas on Eglin AFB. Grasses and low shrubs characterize open grassland/shrubland areas. Eglin maintains this habitat with machinery or fire that removes or prevents future growth (U.S. Air Force, 2003).

Urban/Landscaped Areas

Eglin AFB currently has approximately 46,000 acres of semi-improved areas and 14,000 acres of improved areas. Bahia grass (*Panicum notatum*) is the primary turf grass that is used in the semi-improved areas, while St. Augustine grass (*Stenotaphrum secundatum*) and centipede grass

(*Eremochloa ophiuroides*) are the primary turf grasses used in the improved areas. Ground maintenance encourages low maintenance landscaping and uses native plants whenever possible (U.S. Air Force, 2003).

Flora and Fauna of Ecological Associations

Table 3-5 summarizes some of the plant and animal species commonly found within the ecological associations described above. The list is not a comprehensive inventory of the species found within these ecological associations; the table provides a reference summary.

Table 3-5. Typical Plant and Animal Species of Eglin AFB by Ecological Association

Plants		**Animals**	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Sandhills Ecological Association			
Longleaf Pine	*Pinus palustris*	Red-cockaded Woodpecker	*Picoides borealis*
Turkey Oak	*Quercus laevis*	Bobwhite Quail	*Colinus virginianus*
Blackjack Oak	*Q. marilandica*	Great Horned Owl	*Bubo virginianus*
Bluejack Oak	*Q. incana*	Gopher Tortoise	*Gopherus polyphemus*
Wiregrass	*Aristida stricta*	Indigo Snake	*Drymarchon corais*
Saw Palmetto	*Serona repens*	Diamondback Rattlesnake	*Crotalus adamanteus*
Bracken Fern	*Pteridium aquilinum*	Six-lined Racerunner	*Cnemidophorus sexlineatus*
Blueberry	*Vaccinium* spp.	Florida Black Bear	*Ursus americanus floridanus*
Yaupon	*Ilex vomitoria*	Fox Squirrel	*Sciurus niger*
Gallberry	*Ilex glabra*	Least Shrew	*Cryptodus parva*
Gopher Apple	*Licania michauxii*	Cottontail Rabbit	*Sylvilagus floridanus*
Blackberry	*Rubus cuneifolius*	Pocket Gopher	*Geomys pinetus*
Sand Pine	*Pinus clausa*	White-tailed Deer	*Odocoileus virginianus*
Pine-woods Bluestem	*Andropogon arctatus*	Feral Pig	*Sus scrofa*
Wiregrass	*Aristida stricta*	Raccoon	*Procyon lotor*
Flatwoods Ecological Association			
Longleaf Pine	*Pinus palustris*	Wood Duck	*Aix sponsa*
Runner Oak	*Quercus pumila*	Red-winged Blackbird	*Agelaius phoenicius*
Saw Palmetto	*Serona repens*	Cotton Mouth	*Agkistridon piscivorus*
St. John's Wort	*Hypericum brachyphyllum*	Flatwoods Salamander	*Ambystoma cingulatum*
Slash Pine	*Pinus elliottii*	River Otter	*Lutra canadensis*
Black Titi	*Cliftonia monophylla*	Beaver	*Castor canadensis*
Milkweed	*Asclepias humistrata*	Florida Black Bear	*Ursus americanus floridanus*
Pitcherplant	*Sarracenia* spp.	Gray Fox	*Urocyon cinereoargenteus*

Table 3-5. Typical Plant and Animal Species of Eglin AFB by Ecological Association Cont'd

Plants		Animals	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Wetland and Riparian Ecological Association			
(Freshwater)			
Saw Grass	*Cladium jamaicensis*	Raccoon	*Procyon lotor*
Cattail	*Typha domingensis*	Florida Black Bear	*Ursus americanus floridanus*
Phragmites	*Phragmites australis*	American Alligator	*Alligator mississippiensis*
White Cedar	*Chamaecyparis thyoides*	Pine Barrens Tree Frog	*Hyla andersonii*
Water Tupelo	*Nyssa biflora*	Five-lined Skink	*Eumeces fasciatus*
Pitcher Plant	*Sarracenis purpurea*	Green Anole	*Anolis carolinensis*
Red Titi	*Cyrilla racemiflora*	Garter Snake	*Thamnophis sirtalis*
Wetland and Riparian Ecological Association (Cont'd)			
Tulip Poplar	*Liriodendron tulipifera*	Indigo Snake	*Drymarchon corais*
Sweet Bay Magnolia	*Magnolia virginiana*	American Beaver	*Castor canadensis*
Red Bay	*Persea borbonia*	Parula Warbler	*Parula americana*
Wetland and Riparian Ecological Association			
(Saltwater)			
Black Needle Rush	*Juncus roemerianus*	Periwinkles	*Littorina irrorata*
Salt Marsh Cordgrass	*Spartina alterniflora*	Oyster	*Crassostrea virginica*
Salt Meadow Hay	*Spartina patens*	Gulf Crab	*Calinectes smilis*
Seaside Elder	*Iva imbricata*	Long-nosed Killifish	*Fundulus similis*
Saltgrass	*Distichylis spicata*	Sheepshead Minnow	*Cyprinodon variegatus*
Wax Myrtle	*Myrica certifera*	America Alligator	*Alligator mississippiensis*
Yaupon Holly	*Ilex vomitoria*	Great Blue Heron	*Ardea herodias*
Cattail	*Typha angustifolia*	Belted Kingfisher	*Megaceryle alcyon*
Palmetto	*Serenoa repens*	Raccoon	*Procyon lotor*
Marsh Elder	*Iva frutescens*	Salt Marsh Rabbit	*Sylvilagus aquaticus*

Sensitive Habitats

Sensitive habitats on Eglin include state aquatic preserves, SBSs, ONAs, HQNCs, Gulf sturgeon critical habitat, piping plover critical habitat, and EFH. Section 3.2 addresses floodplains and wetlands (Figures 3-4 and 3-5).

State Aquatic Preserves

The Florida Aquatic Preserves Act (Florida Statutes Sections 253 and 258) established a standardized set of management criteria for designated aquatic preserves in the state. In the act, the state identified the need to preserve state-owned submerged lands in areas that have exceptional biological, aesthetic, and scientific value. One of the criteria for inclusion as a state aquatic preserve is the characterization of the area as an "Outstanding Florida Water." Florida protects these waters through more stringent discharge and use limits than that of previously existing state water regulations. The Rocky Bayou Aquatic Preserve lies to the south of Eglin, and portions of the Yellow River Marsh Aquatic Preserve are found on the west side of Eglin.

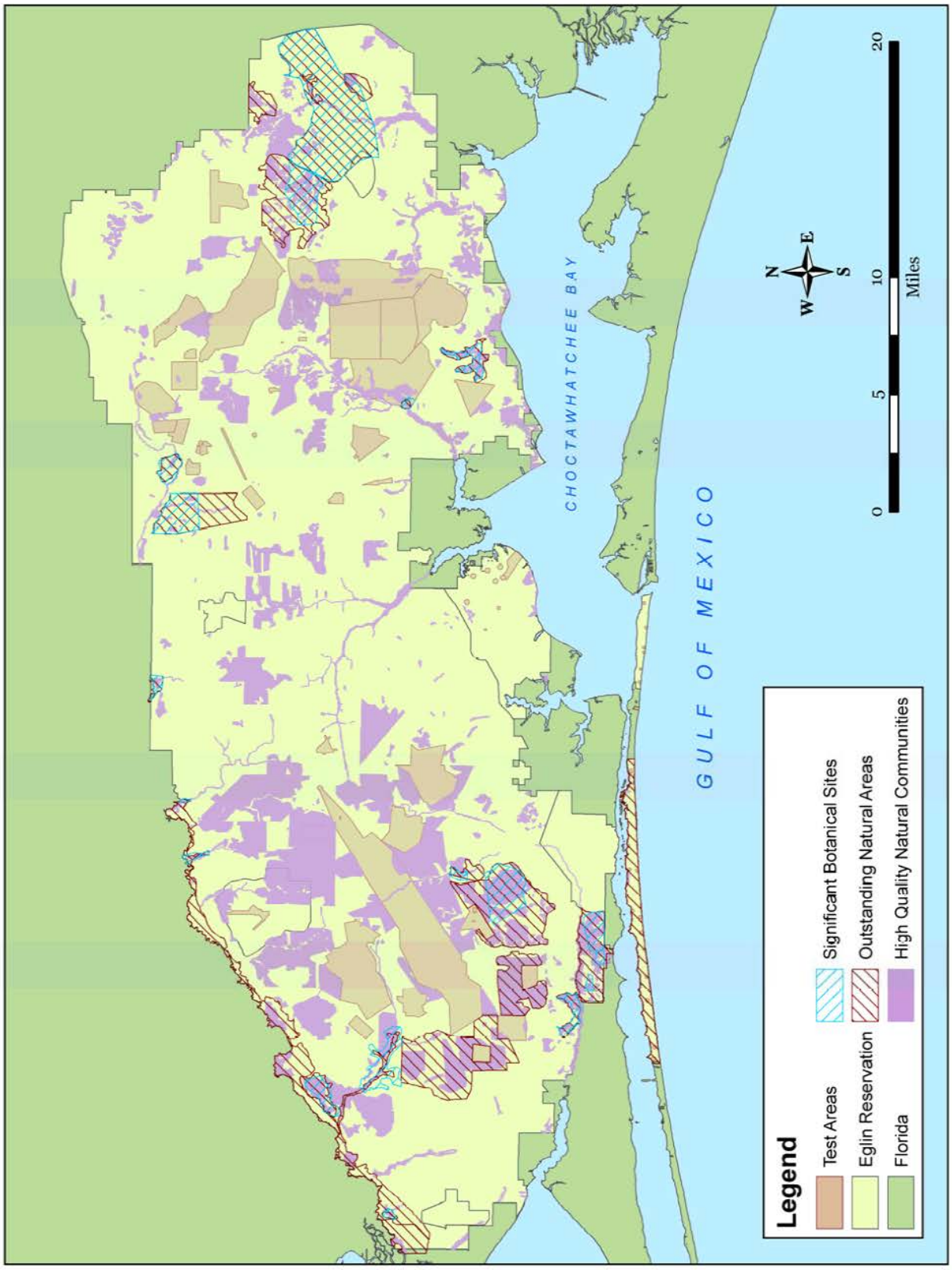

Figure 3-4. Sensitive Habitats on Eglin AFB

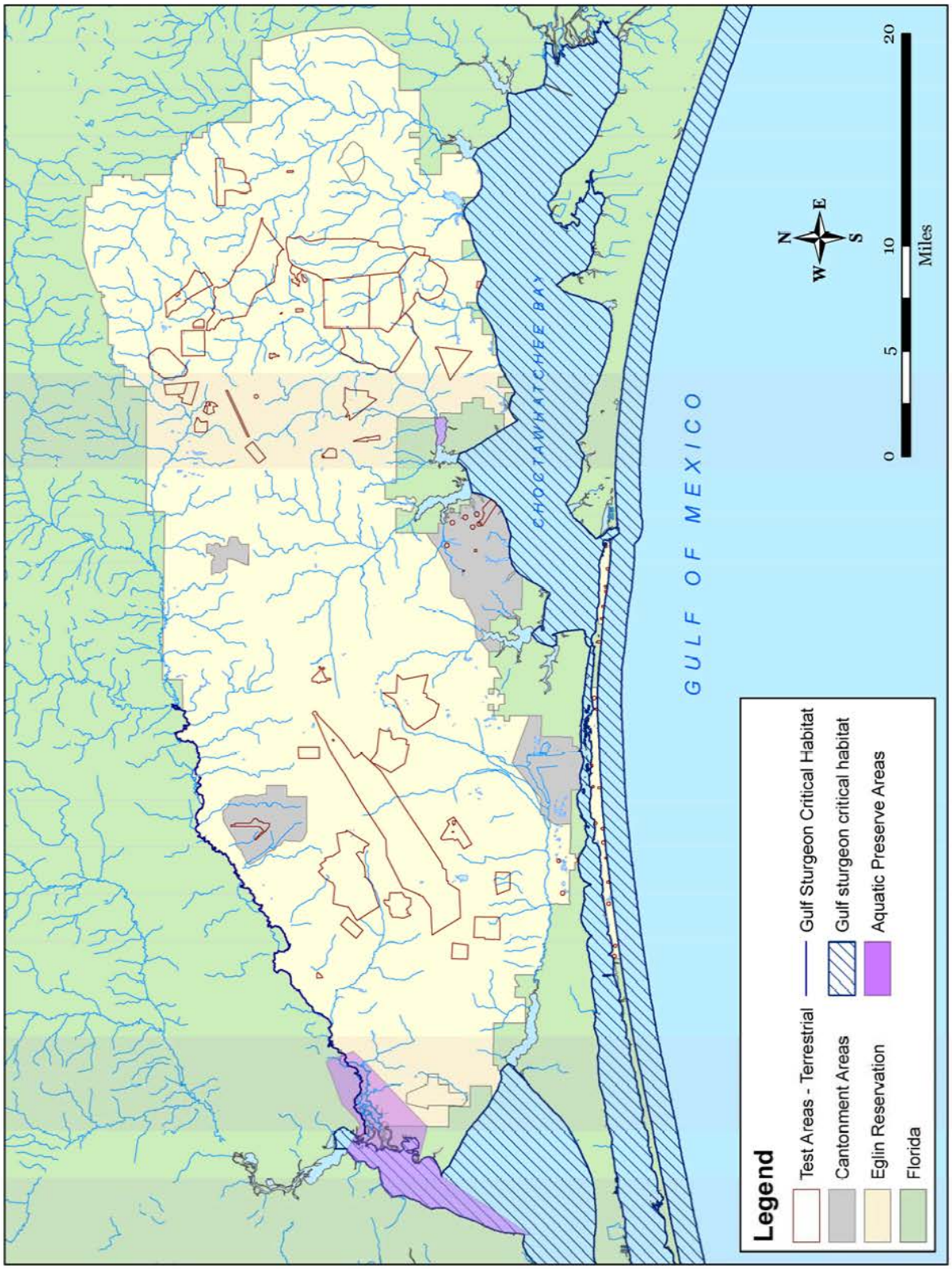

Figure 3-5. Aquatic Preserves, Essential Fish Habitat, and Gulf Sturgeon Critical Habitat Adjacent to Eglin AFB

High Quality Natural Communities

The FNAI identified certain areas of Eglin that are unique due to their high quality examples of natural communities or presence of rare species. Termed HQNCs, these areas are distinguished by the uniqueness of the community, ecological condition, species diversity, and presence of rare species. These high quality areas total 75,266 acres and cover approximately 16 percent of the installation (U.S. Air Force, 2006a).

Outstanding Natural Areas

From the HQNCs, FNAI identified 17 larger-scale landscapes containing complexes of these high quality areas and locations of rare species, which are called ONAs, as listed below (U.S. Air Force, 2006a).

1) A-77 Outstanding Natural Area
2) Alaqua-Blount Creek Confluence
3) Alice Creek
4) Boiling Creek/Little Boiling Creek
5) Brier Creek
6) East Bay Flatwoods and Scrub Mosaic
7) Live Oak Creek
8) Lower Weaver River
9) Patterson Outstanding Natural Area and Extension
10) Piney Creek
11) Prairie Creek
12) Santa Rosa Island
13) Scrub Pond
14) Spencer Flats Wetlands
15) White Point
16) Whitmier Island
17) Yellow River Basin

Significant Botanical Sites

FNAI also identified 15 SBSs that support rare plants on Eglin, as listed below. Large portions of the ONAs and the SBSs overlap with one another. Combined, both of these identified areas total 43,210 acres, or approximately 9 percent of the installation (U.S. Air Force, 2006a).

1) East Bay Savannahs
2) Patterson Natural Area Expansion
3) Santa Rosa Island
4) Blue Spring Creek Lakes
5) Malone Creek
6) Titi Creek Wilderness Area
7) Live Oak Creek
8) Turkey Gobbler Creek Cypress Swamp
9) Turkey Hen Creek Swamp

10) Boiling Creek and Little Boiling Creek
11) Hick's Creek Prairie
12) Whitmier Island
13) Brier Creek
14) Hickory Branch Hardwood Forest
15) Piney Creek

Gulf Sturgeon Critical Habitat

Federally designated critical habitat is defined as specific areas that contain physical or biological features essential to the species' conservation and that may require special management considerations or protection. Gulf sturgeon critical habitat was designated in 2003. As it pertains to the Eglin Range, Choctawhatchee Bay, Santa Rosa Sound, Yellow River, Shoal River, Blackwater Bay, East Bay, and the Gulf of Mexico out to 1 nautical mile offshore of Santa Rosa Island have been designated as critical habitat. The lower rivers provide summer resting and migration habitat, and the bays, sound, and Gulf contain winter-feeding and migration habitat (U.S. Air Force, 2006a).

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act require, among other things, that NMFS and regional fishery management councils designate EFH for species included in a fishery management plan. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies that fund, permit, or carry out activities that may adversely affect EFH are required to consult with NMFS regarding potential impacts and respond in writing to NMFS and fishery management council recommendations. Adverse impacts are defined as impacts that reduce quality and/or quantity of EFH and may include contamination, physical disruption, loss of prey, and reduction in species' fecundity. The management of sensitive habitats on Eglin is the responsibility of the Natural Resources Section. EFH present in the area includes emergent vegetation and submerged aquatic vegetation (seagrasses).

Appendix B, Biological Resources, provides additional detail on all sensitive habitats at Eglin AFB.

Sensitive Species

The terrestrial habitats of Eglin AFB are home to an unusually diverse biological community, including several sensitive species and habitats. This diversity is a result of the long history of natural resource-related activity that has changed the character of its native biota (U.S. Air Force, 2006). Sensitive species are those species protected under federal or state law, to include T&E species (protected under the Endangered Species Act). An *endangered* species is one that is in danger of extinction throughout all or a significant portion of its range. A *threatened* species is any species that is *likely* to become endangered within the foreseeable future throughout all or a significant portion of its range. Impacts to these federally listed species or their habitats are not restricted, but certain activities may require a consultation with the USFWS, depending upon the time of action, place of action, or types of activities.

Alternatively, avoidance of impacts to the species by changing the time of action, place of action, or types of activities in locations of federally listed species can be cost- and time-effective if a consultation is avoided. Eglin has developed an overall goal within the *Integrated Natural Resources Management Plan* to continue to protect and maintain populations of native T&E plant and animal species within the guidelines of ecosystem management (U.S. Air Force, 2006b).

Eglin AFB provides habitat for many state-listed and rare species, as well as federally listed species (Table 3-6 and Figures 3-6 through 3-9). Appendix B, Biological Resources, provides additional detail on sensitive species and sensitive habitats.

Table 3-6. State-listed, Federally Listed, and FNAI-Tracked Species, Eglin AFB

Scientific Name	Common Name	Status	
		State	Federal
Fish			
Acipenser oxyrinchus desotoi	Gulf Sturgeon	LS	LT
Awaous banana	River Goby	–	–
Etheostoma okaloosae	Okaloosa Darter	LE	LE
Pteronotropis welaka	Bluenose Shiner	LS	–
Amphibians and Reptiles			
Alligator mississippiensis	American Alligator	LS	T (S/A)
Ambystoma cingulatum	Flatwoods Salamander	LS	LT
Amphiuma pholeter	One-toed Amphiuma	–	–
Caretta caretta	Atlantic Loggerhead Turtle	LT	LT
Chelonia mydas	Atlantic Green Turtle	LE	LE
Crotalus adamanteus	Eastern Diamondback Rattlesnake	–	–
Dermochelys coriacea	Leatherback Turtle	LE	LE
Drymarchon corais couperi	Eastern Indigo Snake	LT	LT
Eumeces anthracinus	Coal Skink	–	–
Gopherus polyphemus	Gopher Tortoise	LS	–
Graptemys ernsti	Escambia Map Turtle	–	–
Hemidactylium scutatum	Four-Toed Salamander	–	–
Heterodon simus	Southern Hognose Snake	–	–
Hyla andersonii	Pine Barrens Treefrog	LS	–
Macroclemys temmincki	Alligator Snapping Turtle	LS	–
Pituophis melanoleucus mugitus	Florida Pine Snake	LS	–
Rana capito sevosa	Dusky Gopher Frog	LS	–
Rana okaloosae	Florida Bog Frog	LS	–

Table 3-6. State-listed, Federally Listed, and FNAI-Tracked Species, Eglin AFB Cont'd

Scientific Name	Common Name	Status	
		State	Federal
Birds			
Accipiter cooperii	Cooper's Hawk	–	–
Aimphila aestivalis	Bachman's Sparrow	–	–
Ardea alba	Great Egret	–	–
Athene cunicularia floridana	Florida Burrowing Owl	LS	–
Charadrius alexandrinus	Snowy Plover	LT	–
Charadrius melodus	Piping Plover	LT	LT
Charadrius wilsonia	Wilson's Plover	–	–
Egretta caerulea	Little Blue Heron	LS	–
Egretta thula	Snowy Egret	LS	–
Elanoides forficatus	Swallow-tailed Kite	–	–
Eudocimus albus	White Ibis	LS	–
Falco sparverius paulus	Southeastern American Kestrel	LT	–
Haematopus palliates	American Oystercatcher	LS	–
Haliaeetus leucocephalus	Bald Eagle	LT	LT
Pelecanus occidentalis	Brown Pelican	LS	–
Picoides borealis	Red-cockaded Woodpecker	LS	LE
Picoides villosus	Hairy Woodpecker	–	–
Rynchops niger	Black Skimmer	LS	–
Sterna antillarum	Least Tern	LT	–
Sterna caspia	Caspian Tern	–	–
Sterna maxima	Royal Tern	–	–
Sterna sandvicensis	Sandwich Tern	–	–
Mammals			
Peromyscus polionotus leucocephalus	Santa Rosa Beach Mouse	–	–
Trichechus manatus	Manatee	LE	LE
Ursus americanus floridanus	Florida Black Bear	LT*	–
Plants			
Andropogon arctatus	Pine-Woods Bluestem	LT	–
Asclepias viridula	Southern Milkweed	LT	–
Baptisia calycosa var villosa	Pineland Wild Indigo	LT	–
Calamintha dentata	Toothed Savory	LT	–
Calamovilfa curtissii	Curtiss' Sand Grass	LT	–
Calycanthus floridus var floridus	Sweet Shrub	LE	–
Carex baltzelli	Baltzell's Sedge	LT	–
Carex tenax	Sandhill Sedge	–	–
Chrysopsis godfreyi	Godfrey's Golden Aster	LE	–
Chrysopsis gossypina ssp cruiseana	Cruise's Golden Aster	LE	–
Cladium mariscoides	Pond Rush	–	–
Coelorachis tuberculosa	Piedmont Jointgrass	LT	–
Drosera intermedia	Spoon-Leaved Sundew	LT	–
Eleocharis rostellata	Beaked Spikerush	LE	–
Plants (Cont'd)			

Table 3-6. State-listed, Federally Listed, and FNAI-Tracked Species, Eglin AFB Cont'd

Scientific Name	Common Name	Status	
		State	Federal
Epigaea repens	Trailing Arbutus	LE	–
Hexastylis arifolia	Heartleaf	LT	–
Hymenocallis henryae	Henry's Spider Lily	LE	–
Ilex amelanchier	Serviceberry Holly	LT	–
Juncus gymnocarpus	Coville's Rush	LE	–
Kalmia latifolia	Mountain Laurel	LT	–
Lachnocaulon digynum	Bogbuttons	LT	–
Lilium catesbaei	Pine Lily	LT	–
Lilium iridollae	Panhandle Lily	LE	–
Lilium michauxii	Carolina Lily	LE	–
Lindera subcoriacea	Bog Spice Bush	LE	–
Linum westii	West's Flax	LE	–
Litsea aestivalis	Pondspice	LE	–
Lupinus westianus	Gulfcoast Lupine	LT	–
Macranthera flammea	Hummingbird Flower	LE	–
Magnolia ashei	Ashe's Magnolia	LE	–
Magnolia pyramidata	Pyramidal Magnolia	LE	–
Malaxis unifolia	Green Adder's-Mouth	LE	–
Matela alabamensis	Alabama Spiney Pod	LE	–
Medeola virginiana	Indian Cucumber-Root	LE	–
Monotropa hypopithys	Pine Sap	LE	–
Myriophyllum laxum	Piedmont Water-Milfoil	–	–
Nuphar luteum ssp ulvaceum	West Florida Cow Lily	–	–
Panicum nudicaule	Naked-Stemmed Panic Grass	LT	–
Pinguicula lutea	Yellow Butterwort	LT	–
Pinguicula planifolia	Swamp Butterwort	LT	–
Pinguicula primuliflora	Primrose-Flowered Butterwort	LE	–
Platanthera integra	Southern Yellow Fringeless Orchid	LE	–
Polygonella macrophylla	Large-Leaved Jointweed	LT	–
Quercus arkansana	Arkansas Oak	LT	–
Rhexia parviflora	Small-Flowered Meadow Beauty	LE	–
Rhexia salicifolia	Panhandle Meadowbeauty	LT	–
Rhododendron austrinum	Orange Azalea	LE	–
Rhynchospora crinipes	Hairy-Peduncled Beakrush	LE	–
Rhynchospora stenophylla	Narrow-Leaved Beakrush	LT	–
Sarracenia leucophylla	White-Top Pitcherplant	LE	–
Sarracenia rubra	Sweet Pitcherplant	LT	–
Sideroxylon thornei	Thorne's Buckthorn	LE	–
Stewartia malacodendron	Silky Camellia	LE	–
Tephrosia mohrii	Pineland Hoary Pea	LT	–
Xanthorhiza simplicissima	Yellow-Root	LE	–
Xyris longisepala	Karst Pond Yellow-Eyed Grass	LE	–
Xyris scabrifolia	Harper's Yellow-Eyed Grass	LT	–
Plants (Cont'd)			

Table 3-6. State-listed, Federally Listed, and FNAI-Tracked Species, Eglin AFB Cont'd

Scientific Name	Common Name	Status	
		State	Federal
Zigadenus leimanthoides	Coastal Death Camas	LE	–
Lichens			
Cladonia perforata	Florida Perforate Cladonia	LE	LE

LE = endangered: species in danger of extinction throughout all or a significant portion of its range.
LT = threatened: species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
LS = species of special concern is a species, subspecies, or isolated population that is facing a moderate risk of extinction in the future.
T(S/A) = threatened due to similarity of appearance to a species that is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
– = not currently listed but tracked by FNAI due to rarity
* = state-listed as LT but not applicable in Baker and Columbia Counties or the Apalachicola National Forest.

3.4.2 Existing Condition

Ecological Associations

Sandhills Matrix

The Sandhills system is the most extensive natural community type on the Eglin Range, covering approximately 78 percent, or 362,000 acres of the base (Figure 3-10). As little as 5,000 acres of old growth longleaf pine forest remains globally and Eglin's sandhills contain more than any other forest in the world. The Eglin Range contains the largest and least fragmented, single longleaf pine ownership in the world, and has the best remaining old growth longleaf pine (U.S. Air Force, 2006a).

Approximately 16 percent of the Sandhill community has been substantially modified by heavy site impact reforestation techniques and the planting of slash and sand pine species. Another 16 percent of the community has been altered to create open test ranges and administrative/residential areas. Almost half of the remaining acreage of the community remains in a severely cutover condition where scrub oak has become the dominant species (U.S. Air Force, 2003).

During the last 10 years, 9,300 acres of naturally seeded longleaf pine have been released from hardwood competition using the herbicide hexazinone. Results have varied, due primarily to variations in application rates and techniques but also with respect to soil type and weather conditions. In many areas that have not been treated with herbicide and have not been exposed to frequent recurring fire, scrub oaks and encroaching sand pine are now of sufficient size and density to affect midstory crown closure and shade out ground cover, including natural longleaf regeneration (U.S. Air Force, 2003).

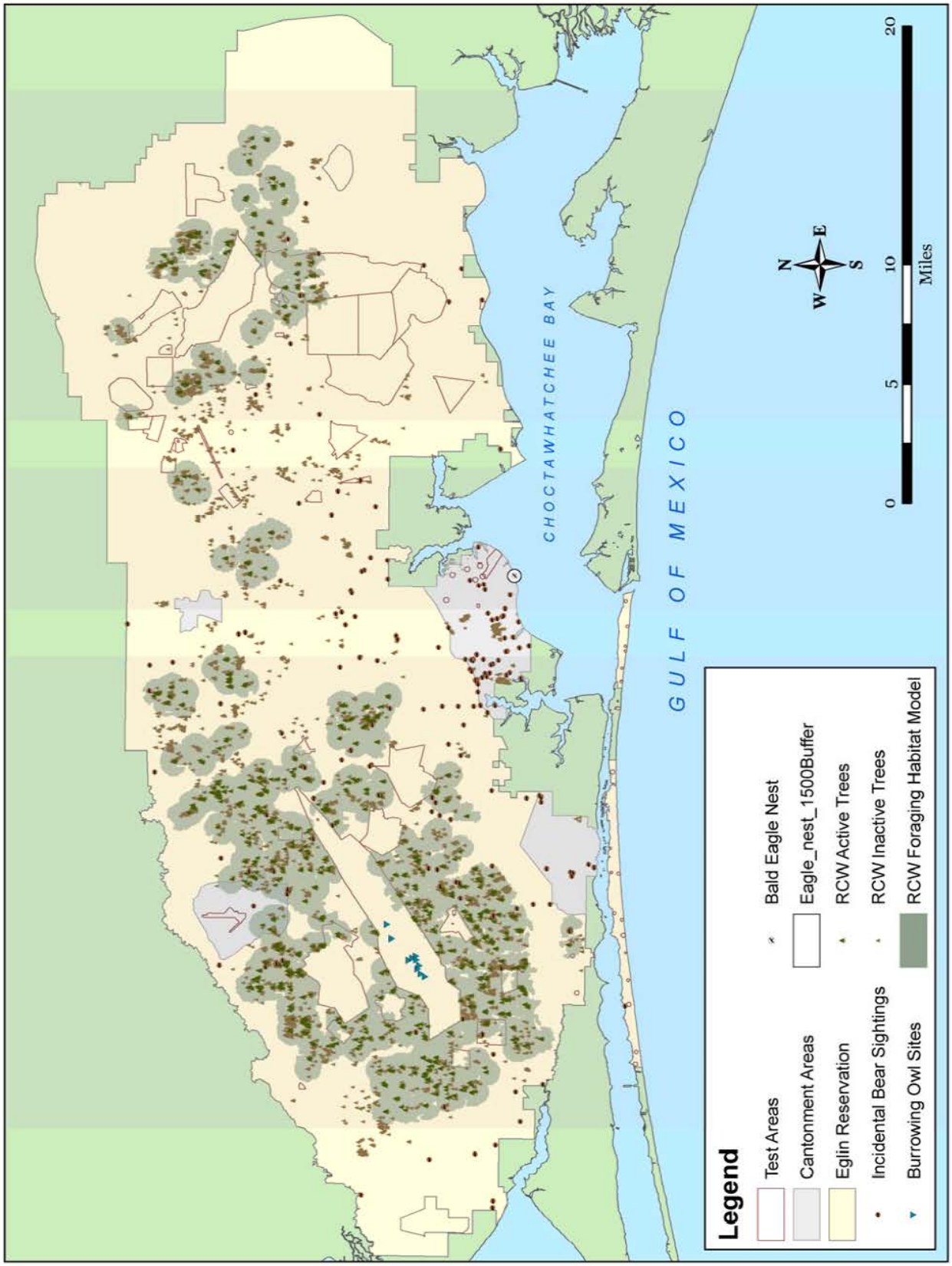

Figure 3-6. Sensitive Birds and Mammals

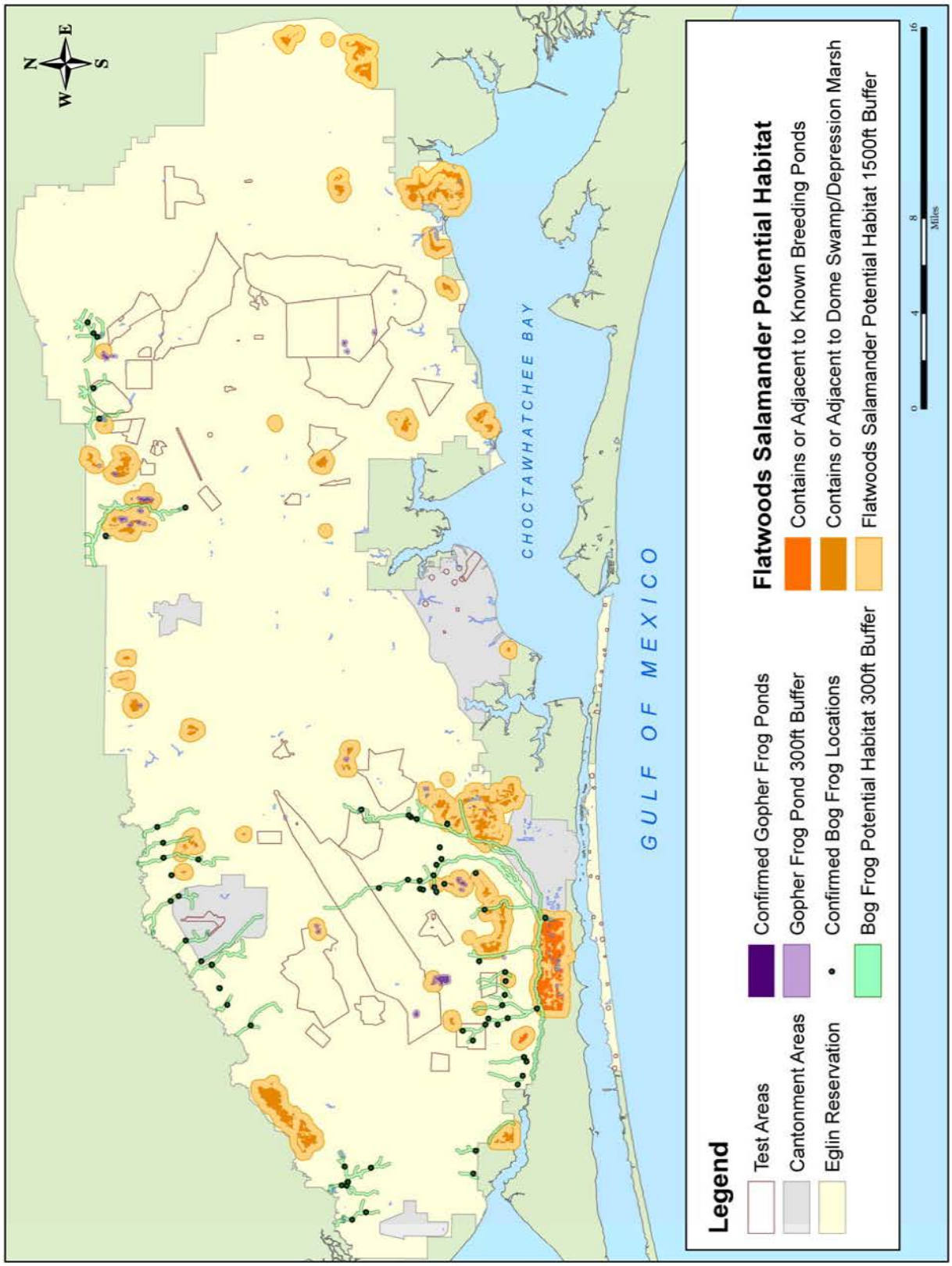

Figure 3-7. Sensitive Amphibians

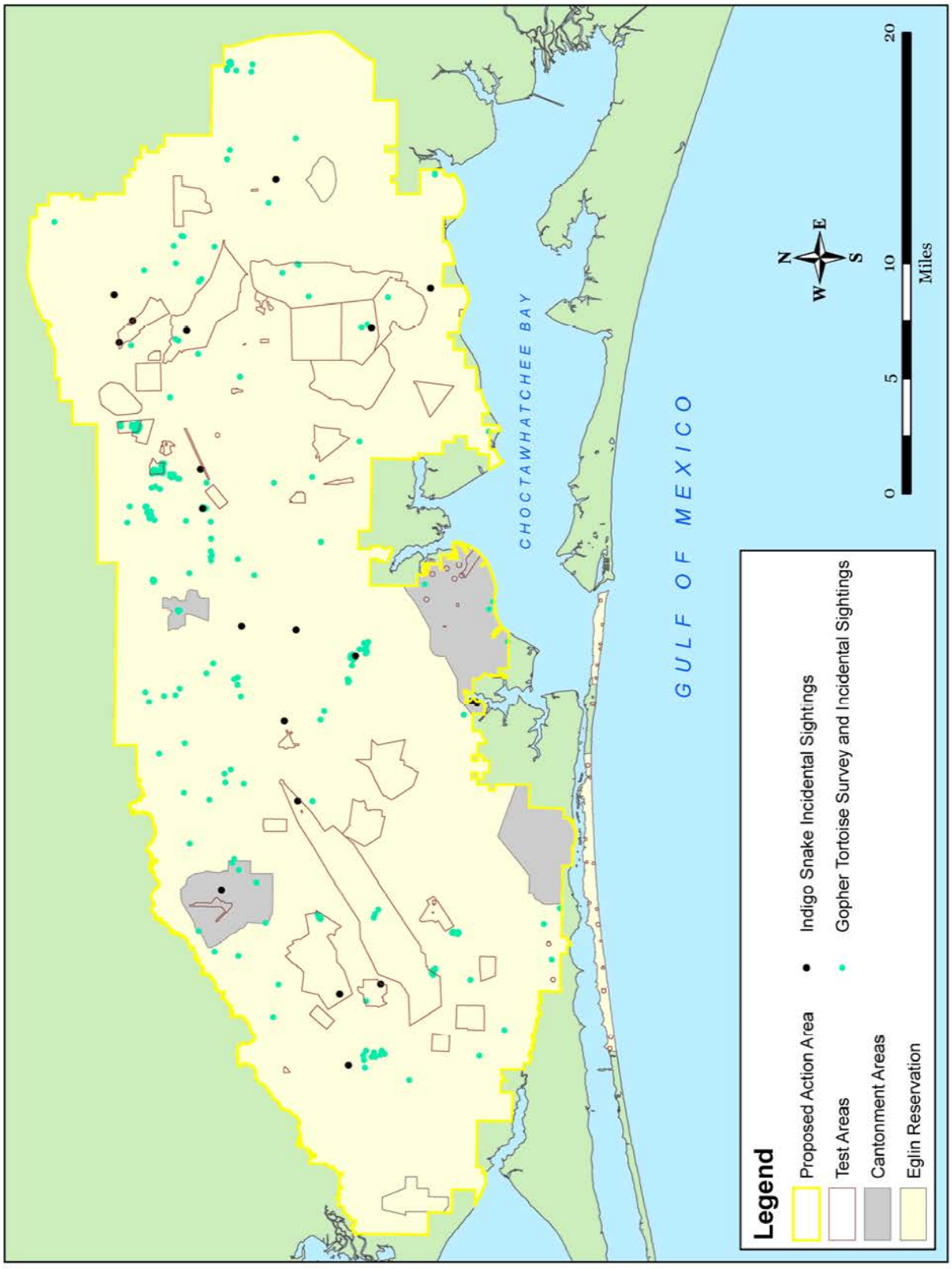

Figure 3-8. Sensitive Reptiles

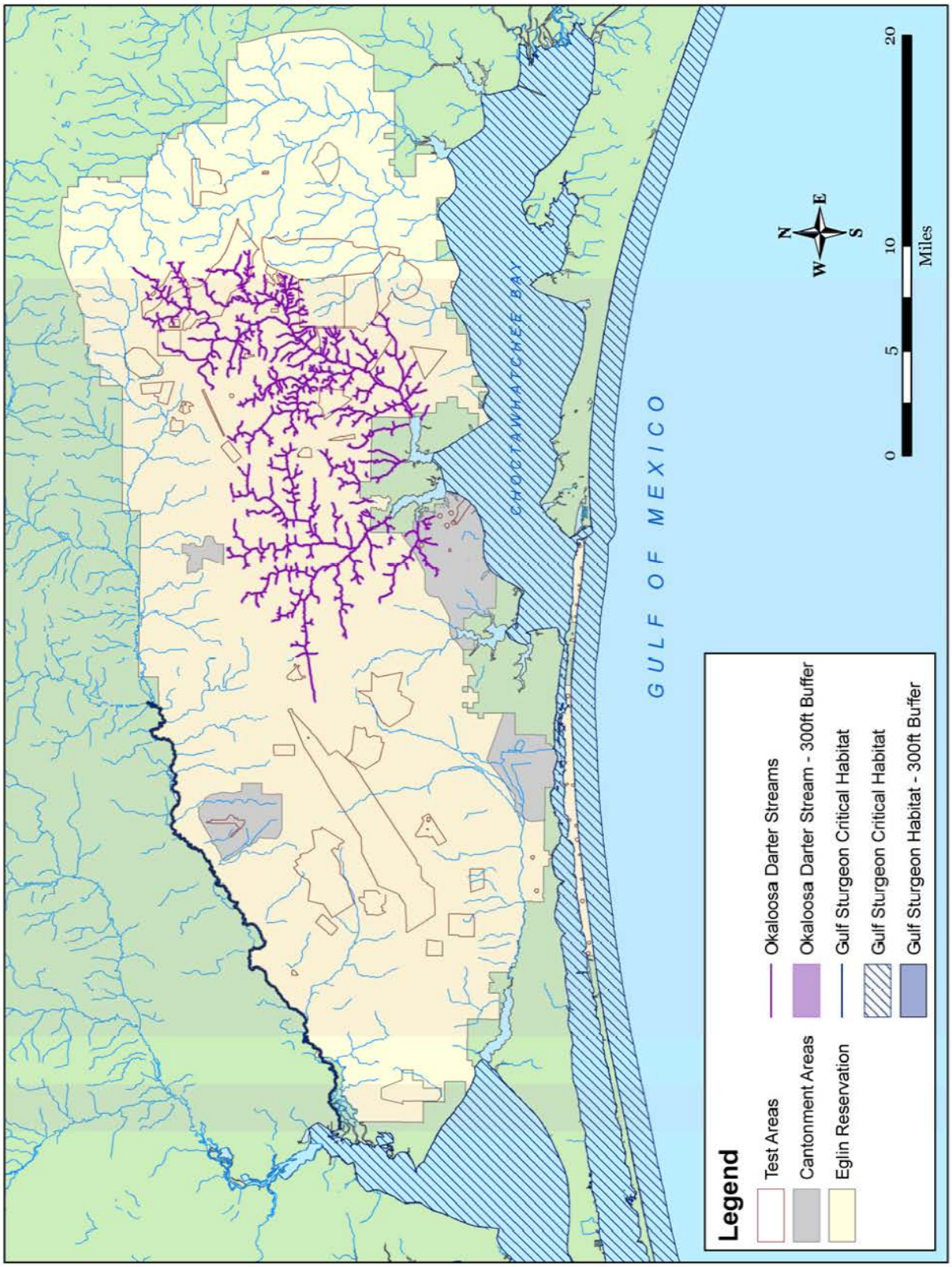

Figure 3-9. Federally-listed Fish Habitat

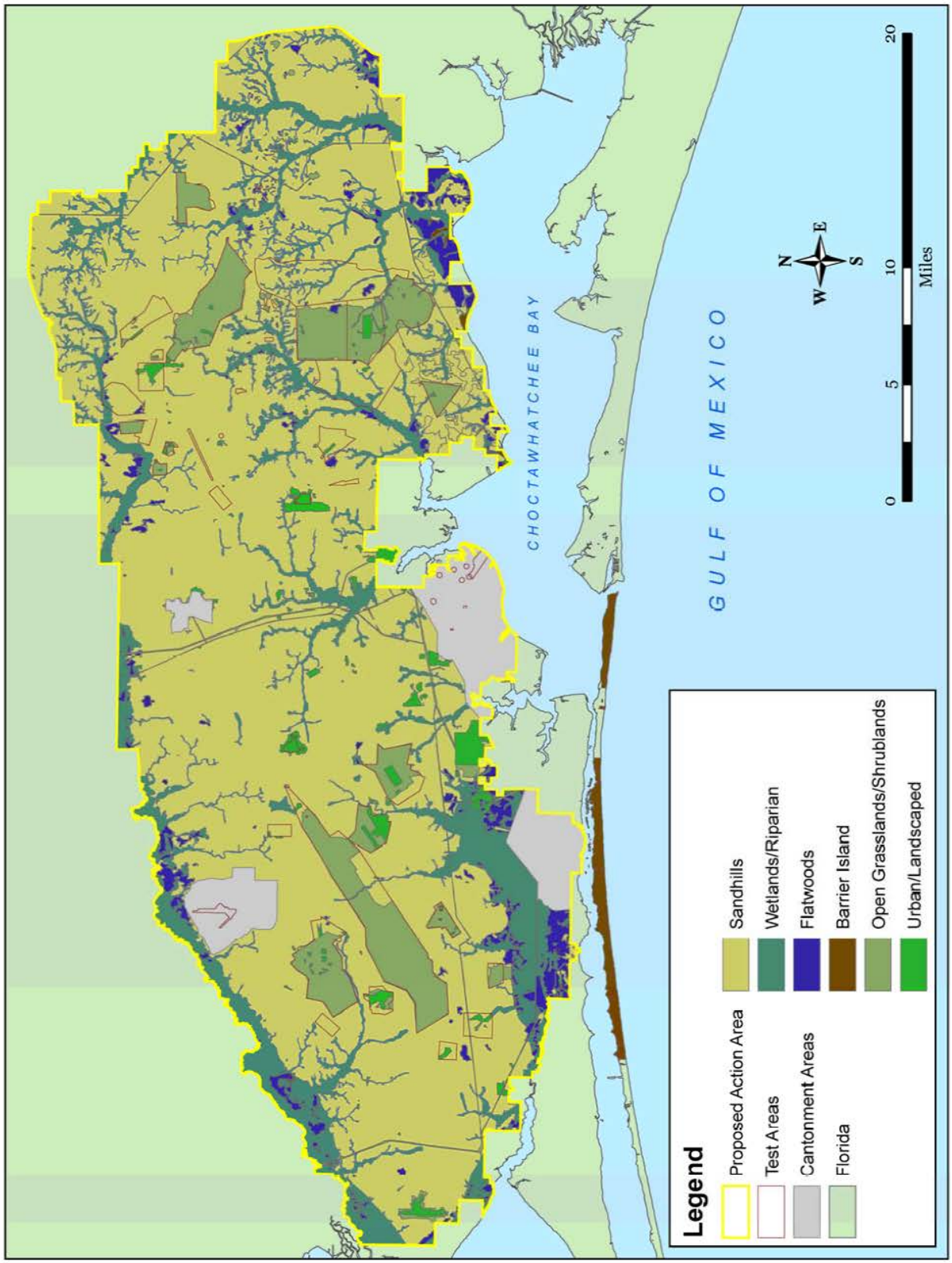

Figure 3-10. Ecological Associations

Flatwoods Matrix

Eglin's more than 300 acres of old growth flatwoods are among the last remaining of such high quality (U.S. Air Force, 2006a). However, most of the flatwoods areas on Eglin are composed mainly of younger, second growth trees (Figure 3-10). Relict longleaf and slash pine and small stands of old-growth longleaf or slash can be found scattered throughout the communities. The plants within these communities are adapted to fire and several species depend on fire for their continued existence, although fire is severely lacking within these communities and has caused parts of the community to succeed to a hardwood forest association. The effects of recent prescribed fire can be seen in parts of this community. Due to past timber cutting practices, lack of fire and spotty-to-heavy natural regeneration over a period of years, the communities vary from an open, park-like appearance, to a very dense, almost impenetrable-looking forest. Longleaf is the dominant pine in almost 90 percent of the communities. The communities tend to look one size due to the relatively young and even-aged stand structure resulting from the past timber harvesting and lack of fire.

Wetlands/Riparian Matrix

Although acreage for each wetland type has not been identified, approximately 61,000 acres of wetlands exists on Eglin, with approximately 1,160 miles of streams/riparian areas (Figure 3-10). Wetlands and riparian areas are, for the most part, in a stable condition. However, Eglin currently has over 200 erosion sites on the reservation, largely the result of erosion from roads and clay and sand pits. Eglin has an active erosion control program lead by the NRS.

Open Grasslands/Shrublands

Open grasslands/shrublands occur in areas of heavily disturbed Sandhills, Flatwoods, and Wetlands/Riparian ecological sites (Figure 3-10). This habitat predominantly occurs within the test areas on Eglin AFB. Grasses and low shrubs characterize open grassland/shrubland areas. Eglin maintains this habitat with machinery or fire that removes or prevents future growth (U.S. Air Force, 2003).

Urban/Landscaped Areas

Eglin AFB currently has approximately 46,000 acres of semi-improved areas and 14,000 acres of improved areas (Figure 3-10). Ground maintenance encourages low maintenance landscaping and uses native plants whenever possible (U.S. Air Force, 2003).

Sensitive Habitats

The Rocky Bayou Aquatic Preserve lies south of Eglin and portions of the Yellow River Marsh Aquatic Preserve are west of Eglin (Figure 3-5). Both aquatic preserves are Outstanding Florida Waters, which means that they have exceptional biological, aesthetic, and scientific value. However, both of these water bodies suffer from excessive sedimentation from upstream and adjacent land uses.

Critical habitat for the Gulf sturgeon is present in most of the water bodies around the Eglin installation (Figure3-5). As it pertains to the Proposed Action, Choctawhatchee Bay, Santa Rosa Sound, Yellow River, Shoal River, Blackwater Bay, and East Bay have been designated as

critical habitat. EFH present near the Proposed Action area includes emergent vegetation and submerged aquatic vegetation (seagrasses) (Figure 3-5)

HQNCs, ONAs, and SBSs are scattered across the Eglin installation (Figure 3-4). These areas received their designations due to their uniqueness, ecological condition, species diversity, and presence of rare species. HQNCs total 75,266 acres and cover approximately 16 percent of the Eglin installation (U.S. Air Force, 2006a). Large portions of the ONAs and the SBSs overlap; combined, these identified areas total 43,210 acres, or approximately 9 percent of the installation (U.S. Air Force, 2006a).

3.5 SOCIOECONOMIC RESOURCES

3.5.1 Definition of the Affected Resource

This chapter discusses the current socioeconomic conditions in the three-county area encompassing and surrounding Eglin AFB. Socioeconomic conditions include employment, income, and population. Each condition is detailed below.

3.5.2 Existing Condition

Employment

Total employment in the three counties surrounding Eglin AFB, which include Santa Rosa County, Okaloosa County, and Walton County, increased by an average annual rate of 17.25 percent between 2001 and 2004. Okaloosa County experienced the largest average annual percentage rate of employment (64.48 percent) between 2001 and 2004 followed by Walton County (42.18 percent) and Santa Rosa County (32.50 percent).

Income

The median household incomes for Okaloosa and Santa Rosa Counties are above the state's average. Walton County had the lowest median household income of the three counties and is below the state and national levels. The median household incomes for counties surrounding Eglin AFB are listed in Table 3-7.

Table 3-7. Median Household Income for Year 2003

Okaloosa County	$43,139
Santa Rosa County	$44,579
Walton County	$34,849
Florida	$38,985
USA	$43,318

U.S. Census Bureau, 2006 (State and County Quickfacts)

Population

Okaloosa County is the smallest in terms of land size of the three counties in the Region of Influence (ROI) yet has the greatest population. Between 1990 and 2000, Walton County's population almost doubled (47.03 percent) and experienced the largest population increase of the

three counties. The average annual percentage change between 2000 and 2005 is 1.32 percent, 4.16 percent, and 4.66 percent for Okaloosa, Santa Rosa, and Walton Counties, respectively (Table 3-8). Population projections into the year 2030 indicate a steady increase for all three counties. The unincorporated areas of each county had the largest population increase between 2000 and 2004. The city of Cinco Bayou is the only city to have experienced a decrease in population over the four-year period. The largest cities in Okaloosa County are Fort Walton Beach, Crestview, and Niceville. In Santa Rosa County, the largest cities are Milton, Gulf Breeze, and Jay. The largest cities in Walton County are Defuniak Springs, Freeport, and Paxton.

Table 3-8. Regional Population from 1990 through 2005

Rank	County	Population						
		1990	2000	2001	2002	2003	2004	2005
24	*Okaloosa County*	143,776	170,908	171,735	175,237	177,807	180,910	182,172
30	*Santa Rosa County*	81,608	118,449	121,856	127,298	132,208	138,073	143,105
41	*Walton County*	27,760	40,816	42,847	44,470	46,347	48,368	50,324
	Florida	15,982,378	16,048,887	16,350,565	16,677,860	16,993,369	17,385,430	17,789,864

Office of Economic and Demographic Research, 2006

Recreation

In accordance with the Sikes Act, the Air Force has provided many public recreation areas in order to support various recreational activities on the Eglin AFB reservation. With the exception of approved campsites after sunset, public recreation on Eglin is permitted during daylight hours only. There are 280,000 acres of land open for outdoor recreation. Activities include hunting, fishing, hiking, and camping, with the most popular being hunting and fishing. All persons that engage in outdoor recreational activities are required to adhere to applicable Eglin AFB, federal, and state laws, rules, and regulations. Unless the Commander, Air Armament Center, has granted special permission, entry into both "closed" areas and "seasonally closed" areas is prohibited. Areas such as the east end of Okaloosa Island, designated as "open," are available for all types of outdoor recreation with the exception of hunting. All rules, regulations, and safety warnings for recreational activities can be obtained from the Natural Resources Section at Eglin AFB (U.S. Air Force, 1998) and are provided to all permit holders.

3.6 ENVIRONMENTAL JUSTICE AND RISKS TO CHILDREN

3.6.1 Definition of the Affected Resource

EO 12898, called, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was issued in 1994 in response to concern over a disproportionate amount of health and environmental impacts occurring to minority and/or low-income populations. The EO addresses the need for consideration of environmental justice, or the equal consideration of all types of communities, in the impact analysis process.

In compliance with the EO, areas with concentrations of minorities and/or low-income populations higher than the overall county average are identified as "communities of concern" for environmental justice.

Children are typically more sensitive to environmental impacts than adults. In particular, children are at a greater risk to affects from chemical agents. Herbicide application sites may pose a safety risk to children, especially if the sites are unprotected or unmarked.

To ensure all federal agencies take into consideration the health and safety risks to children, President Clinton signed EO 13045 in 1997. The EO was called Protection of Children from Environmental Health and Safety Risks.

3.6.2 Existing Condition

Communities with high concentrations of minorities and/or low-income populations are displayed in Figures 3-11 and 3-12. Cities around the boundaries of Eglin AFB include but are not limited to Holt, Crestview, DeFuniak Springs, Destin, Fort Walton Beach, Navarre, Valparaiso/ Niceville, and Shalimar. The cities of Crestview, DeFuniak Springs, and Fort Walton Beach all have large concentrations of minority populations (see Figure 3-11). Areas surrounding Holt, Crestview, DeFuniak Springs, and Freeport have concentrations of low income populations or mixed, minority/low income areas. Valparaiso/ Niceville comprises mostly low income, minority/low-income, and no concern areas. Destin, Shalimar, and Navarre include mostly no concern areas but do have some minority/low income and minority populations that are centrally located.

For this analysis, the minority population is calculated by taking the total white, non-Hispanic population and subtracting that number from the total population. The percentages are computed for the counties surrounding the proposed and alternative site and summarized in Table 3-9.

Table 3-9. Minority Population for Counties Surrounding Eglin (2003)

County	White, Not Hispanic	Minority
Okaloosa	79.7%	21.3%
Santa Rosa	88.4%	11.6%
Walton	87.3%	12.7%

U.S. Census Bureau, 2006; 2006a; 2006b (State and County Quickfacts)

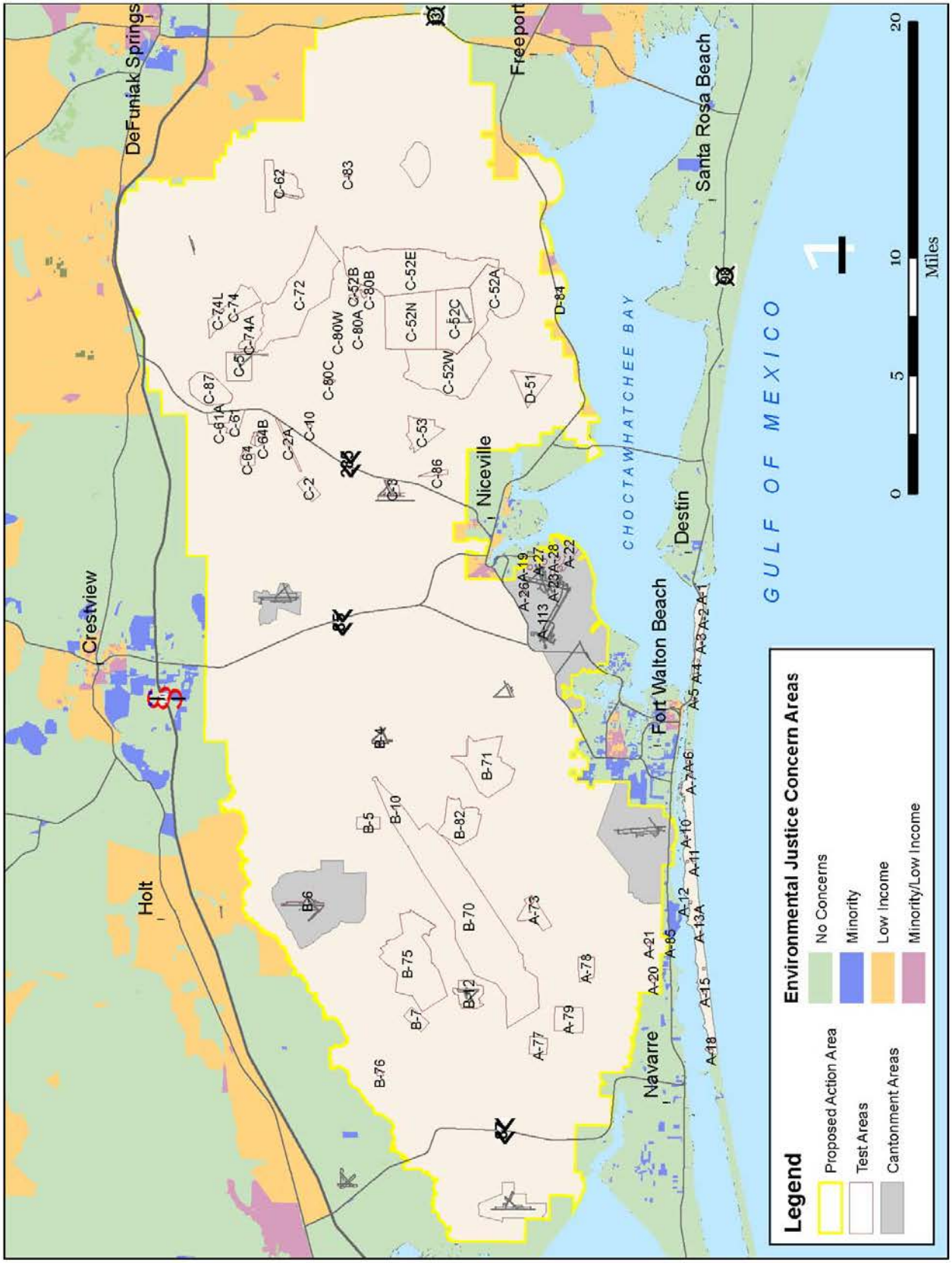

Figure 3-11. Environmental Justice Concern Areas

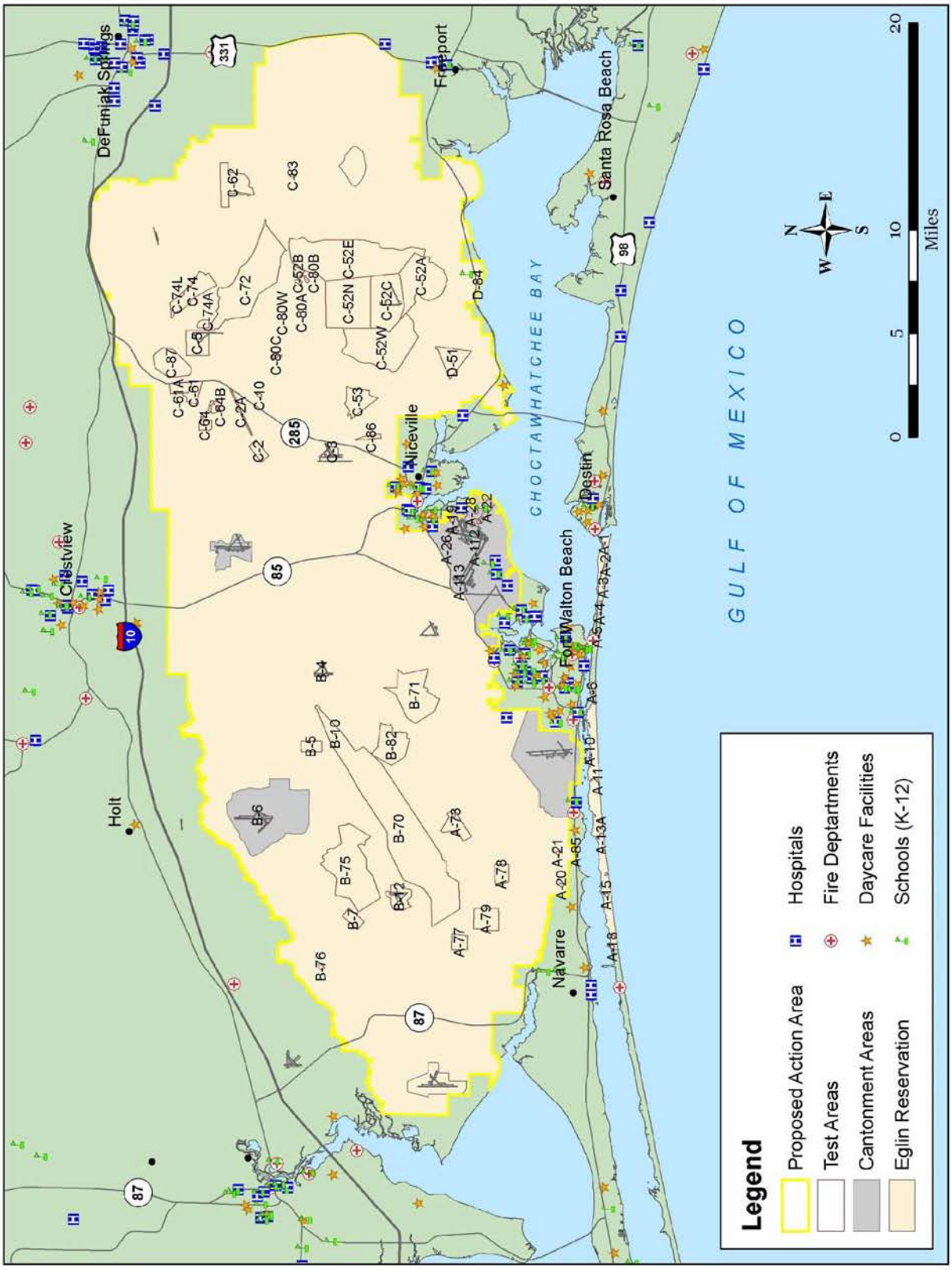

Figure 3-12. Areas with Potential Risk to Children

Persons that are considered "low income" include individuals whose income falls below the established poverty threshold. The threshold, which is adjusted each year, is based on a number of factors including family size, age of householder, and number of children under the age of 18.

The state of Florida experienced a higher percentage of low-income families than the national average. However, the low-income population in both Okaloosa County and Santa Rosa County was smaller than the national average, with only 10 percent of the population falling below poverty level. Walton County had a higher percentage of low-income families than the national and state average, with 13.4 percent of the population below poverty level. Low-income areas are also summarized in Table 3-10 and shown in Figure 3-11.

Table 3-10. Percentage of Persons Below Poverty (2003)

Area	Persons Below Poverty
Okaloosa County	9.9%
Santa Rosa County	10.0%
Walton County	13.4%
Florida	13.0%
United States	12.5%

U.S. Census Bureau, 2006; 2006a; 2006b (State and County Quickfacts)

Areas of major concern include schools, childcare facilities, and hospitals. These are areas that typically have higher concentrations of children. As indicated on Figure 3-12, there are 72 public schools (K-12), 63 day care facilities, 102 hospitals and medical facilities, and 27 fire stations within 15 miles of Eglin AFB. Figure 3-12 shows areas of major concern in relation to Eglin AFB.

3.7 SAFETY

This section provides definitions of safety as they pertain to Eglin AFB long-term vegetation maintenance. Safety facets discussed include Eglin AFB regulations and management, restricted access, and federal and state safety regulations.

3.7.1 Definition of the Affected Resource

For purposes of this document, *safety* refers to the protection and wellbeing of herbicide applicators as well as the general public in regards to the vegetation maintenance activities on Eglin AFB.

3.7.2 Existing Condition

The existing safety environment encompasses risk to public health and, with respect to the Proposed Action, risk to the health of herbicide applicators and those measures designed to minimize that risk. For actions occurring on military property with inherent safety risks, procedures are in place that minimize or eliminate altogether risks to the public. Such measures include the designation of areas as "restricted" or "closed" to the public, either permanently or temporarily. Such closures are driven by the dimensions of the "safety footprint" of a particular action that may have potentially harmful effects.

Eglin AFB Regulatory and Management Overview

This section outlines the regulations, policies, and management protocols in place at Eglin AFB for range safety. AAC Instruction 91-201, Test Safety Review Process, outlines the primary regulations that establish relevant safety policy and that define requirements and procedures to conduct tests on Eglin AFB as well as areas under its jurisdiction. The AAC Range Safety Office (AAC/SE) and supporting organizations implements this instruction. The Test Safety Review Process, described in the aforementioned AAC Instruction, implements the Operational Risk Management (ORM) process, as specified in AFI 90-901, for all AAC test programs. This process reflects the practical application of ORM as outlined in Air Force Pamphlet 90-902, *ORM Guidelines and Tools*. The steps in the ORM process as they relate to the test safety review process are (U.S. Air Force, 2000a):

- **Identify the hazards.** Personnel involved with the test or activity act as a team to identify potential hazards.
- **Assess the potential risk.** Assess the probability and severity of loss from exposure to the identified hazard.
- **Analyze risk control measures.** Investigate specific strategies and tools that reduce, mitigate, or eliminate the risk.
- **Make control decisions.** Approve the best risk control or combination of controls based on the analysis of overall costs and benefits.
- **Implement risk controls.** Once the appropriate level determines and approves procedures to minimize identified hazards, users implement those procedures during the test.
- **Supervise and review.** Continue the ORM process throughout the accomplishment of every test program.

This instruction affects all test operations conducted under a 46th Test Wing Test Directive. It includes ground-training activities involving 96th Civil Engineer Group (96 CEG) personnel, aircraft, equipment, or airspace. It applies to system program managers, program engineers, test engineers, range safety engineers, and aircrews that are responsible for incorporating safety planning and review into the conduct of test and training programs.

Individual organizations implement safety procedures associated with routine training operations based on its specific training protocols/guidance.

Restricted Access

Restricted access pertains to the temporary or permanent closure of portions of Eglin AFB because of mission activities. The purpose of restricting access to the public during these times is to ensure their safety while maintaining mission integrity. Receptors that the restricted access could potentially impact would include the military and the public desiring to use recreational areas. Test areas with known UXO require Explosive Ordnance Disposal (EOD) escort. Eglin

has permanently closed all test areas except B-76, A-20, A-21, B-5, A-113, C-2A, and C-83 on the main range to all forms of public access.

Currently, herbicides are not aerially applied on areas that are open to the public, so no restricted access policies for herbicide application in these public use areas is currently in place.

Safety Regulations

29 CFR 1910.120, 1996, Occupational Safety and Health Act, Chemical Hazard Communication Program (OSHA). Requires that chemical hazard identification, information and training be available to employees using hazardous materials, and institutes material safety data sheets (MSDS) that provide this information.

Department of Defense Flight Information Publication. Identifies regions of potential hazard resulting from bird aggregations or obstructions, military airspace noise sensitive locations, and defines airspace avoidance measures.

Air Force Instruction 32-7063, 1-Mar-94, Air Installation Compatible Use Zone Program (AICUZ). The AICUZ study defines and maps accident potential zones and runway clear zones around the installation and contains specific land use compatibility recommendations based on aircraft operational effects and existing land use, zoning, and planned land use.

Air Force Instruction 91-301, 1-Jun-96. Air Force Occupational and Environmental Safety, Fire Protection and Health (AFOSH) Program. Identifies occupational safety, fire prevention, and health regulations governing Air Force activities and procedures associated with safety in the workplace.

Florida Statutes, Title XXXII, Chapter 487.031, 2006. Regulation of Professions and Occupations, Pesticide Regulation and Safety, Prohibited Acts. Prohibits the application of any pesticide (or pesticide drift) onto any person or area not intended to be treated. It also requires notification of the earliest time that people can reenter a treated area.

4. ENVIRONMENTAL CONSEQUENCES

4.1 SOILS

Due to their predominately sandy nature, typically the primary concern for soils across Eglin is the elevated potential for erosion. However, under this EA, the potential for chemical contamination and subsequent transport of these contaminants to ground and surface water sources is also a concern.

4.1.1 Proposed Action (Preferred Alternative)

The Proposed Action would not adversely impact soils. The current method of vegetation control (roller-drum chopping then bush hogging/mowing) causes soil disturbance. Since the roller-drum chopper chops an average of 6 inches into the soil, an area with extensive growth may have to be chopped three or four times to wear away stumps before bush hogging equipment can be used exclusively in the area. In this method, the soil is disturbed causing possible soil erosion on steep slopes. The replacement of this method through the use of aerial dispersed targeted chemical herbicides would alleviate erosion potential caused by mechanical methods.

The current use of hexazinone and the newly proposed herbicides on Eglin could impact soils if repeated applications were to occur prior to the complete decomposition of previous applications. However, for ecosystem restoration areas and ranges, repeated applications of herbicide are not prescribed. Two different herbicides may need to be used at different times of the year, or they may need to be applied in different manners. Touchups may be necessary. A follow-up application may be necessary if the first one failed. In most areas, fire would help maintain the treated areas, and more than one or two applications would not occur. In areas where repeated applications of herbicides during a one-year span may be necessary, care must be taken to recognize any buildup of periodically persistent chemicals on a case-by-case basis. Such preventive action would prevent excessive leaching of chemicals through the soils, which would be expected due to the sandy particle matrix common to many areas on Eglin.

Section 4.2 discusses the potential of these herbicides to move through soils and into groundwater supplies. This risk of impacts to soils and groundwater due to repeated applications should be mitigated somewhat by warm humid weather typical to the region around Eglin AFB. These conditions typically aid in the breakdown of herbicides proposed for use in this document.

4.1.2 Alternative 1

Under Alternative 1, all of the herbicides proposed in the Proposed Action would be used, except for herbicides that are approved for application to water (i.e., Habitat and Renovate 3). The effects to soils would be the same as in the Proposed Action; therefore, no adverse impacts are expected if the same mitigations described in the Proposed Action are employed.

4.1.3 No Action Alternative

Under the No Action Alternative, none of the herbicides listed in this EA would be approved for use on Eglin AFB. Under the No Action Alternative, mechanical clearing of vegetation would continue as is currently practiced. Excessive vegetation may grow on some test areas, while other test areas would continue to suffer from erosion due to more ground disruptive practices such as roller-drum chopping.

4.2 WATER RESOURCES

This section discusses the potential direct and indirect (secondary) impacts to water resources from the Proposed Action and Alternative 1 described in Section 3.2, Water Resources. These resources include groundwater, surface waters, wetlands, and floodplains.

4.2.1 Proposed Action (Preferred Alternative)

Under the Proposed Action, no significant impacts to water resources are expected. For the Proposed Action, a "tool box" of herbicides consisting of 10 different chemical formulations would be used for vegetation management on Eglin AFB. Of these 10 herbicides, 3 are labeled for water use and 9 can be used in seasonally dry wetland and drainage areas when they are dry.

There is a potential for groundwater and surface water contamination due to pesticide application. Contamination could result from leaching, stormwater runoff, or directly spraying a water body or wetland with an herbicide not labeled for water use. Major factors influencing herbicide movement from an upland site to surface water or groundwater include the herbicide's solubility in water, its photo- or biodegradation characteristics, its ability to bind with soil and organic matter, and its ability to persist until it reaches a water source. Mobility is discussed in the information profiles for each available herbicide. Aerial application of herbicides poses the highest hazard for surface water contamination, in that the herbicide can inadvertently be directly sprayed or drift into a water body. Wet, marshy areas generally contain higher levels of herbicides for longer periods of time than do upland areas. If applied to seasonally dry stream channels, herbicides or their decomposition products may move into surface waters when rainfall occurs. In addition to chemical mobility, other factors can influence herbicide activity underground and result in groundwater contamination. For example, if microorganisms in the soil that decompose herbicides are absent, as found in some water-saturated soils, herbicides may persist longer than they would in unsaturated soils (USDAFS, 1994). See Table 4-1 for mobility, groundwater contamination potential, and degradation processes/rates of the proposed herbicide active ingredients in water.

Herbicides may also indirectly affect surface waters by reducing vegetation along the banks of streams, rivers, ponds, etc. Loss of vegetation could decrease shore stability and lead to increased water temperatures due to a loss of shade. This increase of temperature could irreversibly change the type and number of organisms that can inhabit that water body.

Table 4-1. Mobility, Groundwater Contamination Potential and Degradation of Herbicide Active Ingredients in Water

Herbicide	Mobility	Groundwater Contamination Potential	Half-life in Water
Aminopyralid	Relatively immobile	Minimal leaching below 15 to 30 cm.	Breaks down in sunlight with half-life of 0.6 days.
Fluroxypry	Moderately mobile	Intermediate potential to leach to groundwater. Highly mobile in runoff.	Breaks down due to microbial degradation to a half-life of 8 to 14 days.
Fosamine	Mobile	Breaks down quickly, not likely to be found in groundwater.	Breaks down quickly in soil, but is stable in water. In water, it is readily degraded by microbes.
Glyphosate	Relatively immobile	Very low potential to contaminate groundwater.	Breaks down due to microbe degradation to a half-life of 12 days to 10 weeks.
Imazapyr	Highly mobile	High potential to leach to groundwater. High surface water runoff potential.	Breaks down in sunlight with a half-life of ~4 days.
Imazapic	Relatively immobile	Low potential to leach to groundwater. Generally moves only 6 to 18 inches in soils.	Breaks down in sunlight with half life of 1 to 2 days.
Metsulfuron	Highly mobile	Potential to contaminate groundwater.	Breaks down in ultraviolet light. Stable in water with half-life of ~30 days.
Sulfometuron-methyl	Moderately mobile	Degrades rapidly, not likely to contaminate groundwater. Tends to stay within the top 3 inches of soil.	Breaks down in water and with sunlight with a half-life of 1 day to 2 months.
Triclopyr	Highly mobile	Potential to contaminate groundwater.	Breaks down in sunlight with a half-life of 2.8 to 83.4 hours.

Information in table obtained from Active Ingredient Fact sheets in Appendix B.
cm = centimeter

Surface runoff of herbicides is also a potential issue. Northwest Florida is one of the wettest areas in the lower 48 states, with a precipitation rate of over 60 inches annually. Some of this rainfall comes in heavy downpours, which may fall so quickly that they exceed the capacity of the soil to absorb the water, resulting in runoff. If heavy rains fall in an area before the herbicides have been taken up by plants, then there is the potential for runoff of herbicides to unintended areas, including water bodies. To minimize this potential, Eglin would time the application of herbicides to avoid upcoming rain events, and establish buffer zones around water bodies, as described below. Additionally, Eglin would strictly follow the application methods and rates detailed for each herbicide, which are intended to maximize absorption by target vegetation and minimize runoff.

The Air Force would protect surface waters and wetlands from the possible negative effects of herbicide application through the use of buffer zones. Buffers zones are strips of vegetated land along streams, rivers, lakes, etc., and wetlands. Buffers have many functions, but possibly one of the most important is that they serve as a filtration device, separating excess nutrients, sediments, and pollutants from stormwater runoff and breaking them down or binding them up within the

soils. These vegetated strips help protect wetlands and water bodies from toxic algal blooms (by filtering out excess nutrients) as well as possible water contamination and fish kills caused by the introduction of herbicides (USFWS, 2001b). Buffers also serve as a barrier, preventing direct herbicide application by aerial spray drift to water bodies and wetlands (University of Georgia, 1999). The width of a buffer zone varies from study to study. The smallest buffer recommended by the Florida State Division of Forestry is 35 feet; however, this is based upon the presence of stable, level soils and an intermittent or perennial stream less than 20 feet wide (FDACS, 2006).

Eglin consists of many different areas with different soil types and water bodies, most of which do not fit the criteria for the assignment of a 35-foot buffer. Considering the most conservative situation of an area with high soil erodibility, a slope greater than 22 percent, and a perennial stream of 21 to 40 feet wide, a general buffer zone of 300 feet is recommended around water bodies and wetlands. However, if the percent slope, soil erodibility quotient, and water body type and width are determined for a specific area, a smaller buffer zone may be utilized by referring to the Florida State Division of Forestry Silviculture Best Management Practices Handbook (Appendix F). If using an herbicide with an aquatic use label, a buffer zone would not be needed, unless there were restrictions due to sensitive species or habitats.

Herbicide application has the potential to impact groundwater and surface water; however, the proposed herbicides tend to degrade quickly in the environment through exposure to sunlight, water, soil components, and/or by decomposition by microbes. Additionally, the application of the avoidance and minimization measures outlined in Chapter 2 (summarized below) would minimize the potential for nonaquatic label herbicides reaching water bodies; thus, negative impacts to water resources are not anticipated.

Employ a general 300-foot buffer zone around surface waters, wetlands, and floodplains (unless using an herbicide labeled for water use), or determine the soil erodibility, slope, and surface water width of a particular area and use that information along with the Florida State Division of Forestry Silviculture Best Management Practices Handbook (Appendix F) to create a smaller buffer zone as appropriate. Where available, check reports of depth to groundwater and avoid application of herbicides to test areas having shallow [10 feet below surface] groundwater.

4.2.2 Alternative 1

The effects would be the same as in the Proposed Action; therefore, no adverse impacts are expected if the same mitigations described in the Proposed Action are employed. Under Alternative 1, all of the herbicides proposed in the Proposed Action would be used except for herbicides that are approved for application to water (i.e., Habitat and Renovate 3).

4.2.3 No Action Alternative

Under this alterative, Eglin AFB would not have access to a "tool box" of herbicides to use for test area maintenance and to exterminate (on a large scale) non-native invasive plant species range wide as required in EO 13112. Hexazinone would continue to be used along with roller-drum chopping and bush hogging to control vegetation on test areas. Therefore, erosion would continue to be a problem in some areas, threatening the federally and state endangered Okaloosa darter as well as area water quality.

4.3 AIR QUALITY

This analysis focuses on the affects to regional air quality from herbicide application and prescribed burning of herbicide treated areas. The primary emissions of concern are hazardous air pollutants from herbicide drift with aerial application and potential toxics emitted via burning treated areas.

4.3.1 Proposed Action (Preferred Alternative)

The Proposed Action would not adversely impact regional air quality. Currently Eglin AFB does not anticipate an increase in prescribed burn acreage. Herbicides would be applied via manual, ground, or aerial application and prescribed burning would take place a year or more later.

The use of general information regarding herbicide use, application, and effects to treated areas followed by a prescribed burn are used for this analysis. It is assumed in this analysis that the herbicides proposed in this action would react similarly to those in the studies and are used as basis for the analysis conclusions.

Herbicide Application

The use of herbicides would have little effect on the criteria pollutants (CO, NO_x, PM_{10}, SO_x, and VOCs); the primary concern is the release of hazardous air pollutants. A major concern with herbicide application is herbicide drift causing negative affects to nearby receptors (i.e., non-target plants, wildlife, or humans). Drift is most likely with aerial application. Spray drift is dependent primarily on droplet particle size, release height, and wind speed.

Liquid spray droplets most likely to drift are usually 100 microns or less. Most spray equipment is designed to produce 200 micron droplets (USDAFS, 2006a). Small droplets are a minor portion of the total spray volume, their significance beyond area boundary rapidly declines as they are diluted in increasing volumes of air. Herbicides could be moved out of the target area while adsorbed by dust particles by wind. Once in the air, spray droplets are subject to photodecomposition by sunlight.

Wind speed increases the concentration of drifting droplets leaving the treated area if the wind is blowing away from the release point toward sensitive receptors. Drift can be reduced if the wind is blowing into the treatment area. Numerous studies have shown that over 90 percent of spray droplets land on the target area and about 10 percent or less move off-target (USDAFS, 2006a). The droplets that move off-target most typically deposit within 100 feet of the target area. Drift deposition on surfaces measured downwind from aerial spray sites is typically less than 1 percent, and often less than 0.1 percent, of on-site deposition (USDAFS, 2006a).

The application of the mitigation measures outlined in Section 2.1 (for example, herbicide application will not occur during wind speeds greater than 10 miles per hour) would minimize drift occurrences. The addition of surfactants or adjuvants also decreases the drift area. Adverse impacts to air quality are not expected from herbicide application.

Prescribed Burning

There has been public concern regarding possible exposure to herbicide residues in smoke from the fire. These concerns are based on warning statements found on herbicide labels and material data safety sheets (MSDS) referring to fire hazards and toxic decomposition products in smoke from treated vegetation. The cautions on the labels were not intended to apply to the diluted forms following an application to forested sites (Bush et al., 2003). In this instance, on any given acre, only a few ounces or pounds of herbicide are spread over many thousand pounds of ground litter and vegetation (see the maximum application rate in Table 2-7). The latter material is the predominant fuel in the prescribed burn and the principal smoke risk factor to the worker or the public.

Several studies testing smoke suspended particulate matter (SPM), herbicide residues, and carbon monoxide in the field worker breather zone have been completed. One study found no herbicide residues in 140 smoke samples from 14 fires of sites treated with labeled rates of forestry herbicides containing the active ingredients imazapyr, triclopyr, hexazinone, and picloram (Bush et al., 2003). The sites were burned 30 to 169 days following herbicide application. SPM and CO levels varied widely depending on the fire conditions, size of tract, and worker assignment. Another study shows that fire intensity directly impacts the extent of herbicide combustion and volatilization. Upslope fires resulted in low combustion efficiency (high smoke production) giving a recovery of 5 percent 2,4-D and 0.04 percent picloram. Herbicide recoveries from downslope fires were less than 0.02 and 0.08 percent for picloram and 2,4-D, respectively (Bush et al., 2003).

Forestry-use herbicides have been detected in the air at short ranges (less than 1 kilometer) after aerial applications (spray drift) but generally not after prescribed burns in herbicide-treated stands. Forestry herbicides also have not been detected in regional air mass samples or rainfall during nationwide air quality studies (Majewski and Cadel, 1995 as cited in Bush et al., 2003). Herbicide concentrations in the air dissipate with distance from the burn site; thus, the public would be expected to have lower exposures than on-site workers.

Under the Proposed Action, prescribed burns would take place a year or more after the herbicide application took place. Further, the half-lives of the proposed herbicides are relatively short; the longest half-life being 25 to 142 days for imazapic and imazapyr. As stated previously, only a few ounces or pounds of herbicide are spread over many thousand pounds of ground litter and vegetation (Table 4-2). Based on the studies summarized above, the amount of viable herbicide available on-site is expected to be negligible by the time prescribed burning would take place, thus the volatilization and dispersion of herbicide to the air via smoke is not expected to have adverse impacts to regional air quality. The primary emission would be carbon monoxide and particulate matter for smoke. No adverse impacts are expected to regional air quality from prescribed burning of herbicide treated areas.

Table 4-2. Estimated amount of Herbicide per acre of Treated Land One Year Following Treatment

Herbicide	Max application rate[1]	Half-life[2]	Amount of Herbicide per Acre On-site After 365 days
Aminopyralid	7 ounces	30 days	0.0015 ounces
Fluroxypyr	2.6666 pints	36 days	0.0024 pints
Fosamine	3 gallons	7 days	6.0E-16 gallons
Glyphosate	8 quarts	25 days	0.00032 quarts
Imazapic	12 ounces	142 days	2.0 ounces
Imazapyr	6 pints	142 days	1.0 pints
Metsulfuron	4 ounces	42 days	0.0097 ounces
Sulfometuron methyl	8 ounces	30 days	0.0017 ounces
Triclopyr	3 gallons	46 days	0.0123 gallons

[1] The largest quantity listed for each herbicide type was used to obtain the maximum amount of herbicide (Table 2-7).
[2] The longest half-life was used in this calculation to obtain the maximum amount of herbicide (Table 2-7).

Air Quality Summary

Based on the information provided in this analysis, aerial herbicide applications would have a very short-term localized impact as a result of drift. Most drift would settle within 100 to 200 feet of the release point in adverse conditions. Aerial applications should be made when wind speed is less than 10 miles per hour.

Prescribed burns occurring a year or more following herbicide treatment are not expected to increase air emissions. The primary emissions generated would be from the burning vegetation. Due to the dilution of the herbicide during application and the short half-lives of the herbicides, the amount of herbicide emitted to the air during burning activities would be negligible. Since the amount of land burned annually is expected to remain the same, the emissions from prescribed burns are expected to remain the same as previous years.

Adverse impacts to regional air quality are not expected from the application of the proposed herbicides and the prescribed burning of herbicide-treated land.

4.3.2 Alternative 1

Alternative 1 would utilize the same herbicides except those suitable for use on aquatic habitats. Herbicide use would be significantly less than the preferred alternative in the number of acres treated, intensity, and frequency of treatments. Where it is possible to avoid aquatic habitats and other protected habitats, aerial application would still be employed, especially in areas inaccessible by ground equipment or where unexploded ordnance is located. This application method would be used less than that in the Proposed Action, due to the presence of aquatic habitats on many of the areas that would require aerial applications.

Herbicide Application

Section 4.3.1 detailed the effects of herbicide drift from aerial application methods as well as prescribed burn of treated areas. For aerial application that occurs in low wind (less than 10 mph) situations, less than 1 percent of the diluted herbicide is expected to drift off-target (USDAFS, 2006a). With decreased use of aerial application from that under the Proposed Action, the potential for drift would be minimal for Alternative 1.

Prescribed Burning

Alternative 1 would utilize less herbicide; therefore, acres of land burned following treatment would also be decreased. The annual amount of acres managed with prescribed burns was assumed to remain the same as previous years. The amount of treated acres burned would be decreased due to the limited use of herbicides. Many of the herbicides have short half-lives; thus, the amount of herbicide present on treated land one year following application would be minimal (Table 4-2). Under Alternative 1, herbicide releases to the air via prescribed burning of treated land is not expected to have adverse affects on the regional air quality.

Air Quality Summary

Due to the decreased use of herbicides under Alternative 1, the potential for herbicide release to the air and possible receptors would be less than under the Proposed Action. The elimination of herbicides used in aquatic areas decreases the ability to aerial application in areas that contain aquatic habitats, thus decreasing drift potential to off-target species and receptors. Also, the decreased application areas would also reduce the acres of treated land that would be burned; therefore, herbicide emissions from prescribed burning of treated areas would be minimal.

Adverse effects to air emissions are not expected from aerial application or prescribed burning of treated areas for Alternative 1.

4.3.3 No Action Alternative

Under the No Action Alternative, Eglin AFB would continue to use mechanical, hexazinone, and prescribed burning for vegetation control and management. Air quality would not change from current emissions as annually reported in the air emissions inventories (prescribed burn).

4.4 BIOLOGICAL RESOURCES

There is a concern that herbicide treatments may impact biological resources due to herbicide toxicity, habitat modification, and displacement during treatment. For analysis purposes, the biological resources are divided into three groups: flora and fauna, sensitive habitats, and sensitive species. Fauna are further categorized into terrestrial mammals, birds, and reptiles as well as amphibians and fish, for comparable analyses.

Several Environmental Impact Statements (EISs) concerning herbicide use have been published in recent years (USDAFS, 2005), such as the Beaverhead-Deerlodge Noxious Weed Control EIS and the Helena National Forest Weed EIS (USDAFS, 2002; USDAFS, 2003). Individually or collectively, these analyses looked at the general effects of herbicides on fish, amphibians, and

invertebrates. None of these analyses determined that there would be significant impacts to fisheries and other aquatic life from the proper use of herbicides.

The proposed herbicides include three formulations that can be applied to water, nine that can be applied to seasonally dry wetlands, and four that can be applied to dry areas, away from water or wetlands. These herbicides have short half-lives and degrade at an increased rate when exposed to sunlight, water, or microorganisms in the soil (see Table 2-1).

Maximum herbicide application rates given on the product label are expressed in a weight or volume to be applied per acre (i.e., pounds/acre, quarts/acre), depending on if the herbicide is in solid or liquid form. Using this information, milligrams per a specified area can be determined. Animal testing results are almost always documented in milligrams of the herbicide they were given for each kilogram of their weight.

As shown in Table 4-3, the amount of herbicide applied at the maximum application rate for 1 square foot would be as low as 2.0 mg. This information is important because it allows one to visualize the effects of herbicide application more intimately. For example, if Renovate 3 was aerially applied to Eglin at the maximum application rate of 2 gallons per acre (which equates to 197.27 mg/ft^2), a rat that weighed 1 kg (about 2.2 pounds) would have to eat everything over an area of 9.36 ft^2 to reach the LD_{50} level. This consumption would have to take place before the herbicide started to degrade through volatilization, adsorption, leaching, plant uptake, or numerous other chemical and biological processes. This would mean the rat would have to eat many kilograms of vegetation within a day to get enough of the active herbicide in its body at one time to get to the LD_{50} level. At the same time, the rat would be eliminating some of the herbicide in its waste. Therefore, the likelihood of any animal ingesting (and retaining) or getting enough of the herbicide on its skin to kill or cause acute harm is nearly impossible, even when the herbicide is applied at the maximum rate allowable.

None of the proposed herbicides have been found to have chronic effects (i.e., cause cancer, birth defects, reproductive problems, or gene mutations) (Table 2-5). Therefore, no chronic effects from the herbicides are expected.

Table 4-3. Median Lethal Dose (LD_{50}) of the Proposed Action Herbicides on Animals in Comparison to the Maximum Herbicide Application Rate

Trade Name	Chemical	Birds	Rats		Maximum Application Rate mg/ft^2
		LD_{50} = mg/kg	Oral LD_{50} = mg/kg	Dermal LD_{50} = mg/kg	
Milestone	Aminopyralid	>2,000	>5,000	>5,000	5.4
Vista	Fluroxypyr	>2,000	3,162	>2,000^R	29
Accord	Glyphosate	No Data	>5,000*	>5,000*	210
Rodeo	Glyphosate	>2,000	>5,000	>5,000^R	200
Garlon 3A	Triclopyr	No Data	1,847	>5,000^R	295.90
Garlon 4	Triclopyr	No Data	1,338	>5,000	187.71
Garlon 4 Ultra	Triclopyr	501-2,000	No Data	No Data	192.75
Renovate 3	Triclopyr	No Data	1,847	>5,000^R	197.27
Krenite	Fosamine	>5,000	>5,000	>5,000^R	610
Escort	Metsulfuron	>2,510	>5,000	>2,000^R	2.0
Oust	Sulfometuron methyl	>5,000	>5,000	>5,000^R	3.39

Table 4-3. Median Lethal Dose (LD_{50}) of the Proposed Action Herbicides on Animals in Comparison to the Maximum Herbicide Application Rate Cont'd

Trade Name	Chemical	Birds	Rats		Maximum Application Rate mg/ft^2
		LD_{50} = mg/kg	Oral LD_{50} = mg/kg	Dermal LD_{50} = mg/kg	
Plateau	Imazapic	>5,000	>5,000	>5,000[R]	8.88
Arsenal	Imazapyr	>5,000	>5,000	>2,000[R]	29.60
Chopper	Imazapyr	>5,000	>5,000	>5,000[R]	58.12
Habitat	Imazapyr	>5,000	>5,000	>2,000[R]	71.04

*LD_{50} for this compound has not been determined. The LD_{50} values given are for a similar material.
[R]Testing was performed on rabbits.
Information in this table was obtained from Dow AgroSciences, Cerexagri, Inc., DuPont, SePRO, and BASF Material Safety Data Sheets in Appendix B.

This chemical analysis considers the formulation of each herbicide under its commercial name. The primary reason is because each herbicide is manufactured with a proprietary blend of "inert" or "inactive" ingredients. This "blend" generally differentiates a brand name formulation from the generic variant. These inert or inactive ingredients are typically compounds that act to maintain the homogeneity of the herbicide blend. The inactive ingredients may also be manufacturer-added adjuvants (Menalled, 2005). In some cases, the inactive ingredient must be reported under the Superfund Amendments and Reauthorization Act (SARA), Title III, Section 313, Toxic Release Inventory (TRI). This law requires certain manufacturing and federal facilities to submit a TRI form to the USEPA every year to provide information about the amounts of toxic chemicals potentially released into the environment that may affect the public.

In the herbicide Garlon 3A, one of the inactive ingredients is N,N-diethylethanamine (or triethylamine), which is considered a toxic substance. Under SARA Section 313, in order to release 10,000 pounds or more of N,N-diethylethanamine, Eglin AFB would need to fill out a TRI form for this chemical and submit it to the USEPA per SARA Section 313. Given that Garlon 3A contains 3 percent N,N-diethylethanamine, the number of acres that Garlon 3A could be applied to at the maximum application rate (stated on the product label) before having to report N,N-diethylethanamine under SARA Section 313 is about 11,730 acres (Table 4-4).

Table 4-4. Herbicide Application Amounts That Would Require SARA 313 Reporting

Herbicide	SARA 313 Reportable Chemical	% in Product	Number of Acres **
Garlon 3A	N,N-diethylethanamine (or triethylamine)	3.00%	11,730
Renovate 3	N,N-diethylethanamine (or triethylamine)	3.00%	17,596
Vista	Naphthalene	8.35%	43,432
	1-methyl-2-pyrrolidinone	5.00%	72,531
Chopper	n-butanol	No Data Given	---

**Information in this table was obtained from Dow AgroSciences, Cerexagri, Inc., DuPont, SePRO, and BASF Material Safety Data Sheets in Appendix B.
*Reportable chemical has to be reported when this number of acres or greater has been treated.

Eglin AFB would not be able to switch between different brand formulations without taking into consideration the inactive ingredients and whether they are to be reported under SARA Section 313. Additionally, if Eglin does not want to file additional TRI information, the inactive

ingredients could be a limiting factor in how many acres can be treated per year with that herbicide.

Although some of these inactive ingredients are considered toxic or hazardous materials, they are added to herbicides in very small amounts, tend to break down in the environment quickly, and do not have a tendency to bioaccumulate.

4.4.1 Proposed Action (Preferred Alternative)

Flora and Fauna

Flora

Vegetation control using herbicides does kill some nontarget, native plant species. It is important to note that although most vegetation control activities may kill some individual native plants, the action would be intended to enhance restoration activities, increase ecological value, and prevent the far greater loss of species diversity and ecosystem processes resulting from further uncontrolled non-native infestations. Application rate and extent of coverage, either spot or broadcast, can affect what plant species are impacted by the herbicides. Many of the species can be protected by following label application limits and specified protection measures. The timing of application and rotation of herbicides may also be important in limiting impacts to nontarget native vegetation. Rotating between these family groups of herbicides that are selective in nature will significantly limit potential damage to nontarget native plants. Impacts to native plant communities and rare plant species can be greatly reduced while still controlling the target species on the site (USDAFS, 2006).

With regard to INPS, impacts to plant communities are reduced when control actions are taken at an early stage of invasion. Effects on plant communities increase as INPS infestations expand in size and density. The increased impacts come not just from the INPS but also from the control measures. When treatments must be broadcast across an entire area and not specifically focused on the target plant, control measures have a greater potential for negative impacts.

Just as changes in plant diversity or species composition can occur due to invasive plants, changes can also occur due to treatments. Short-term changes in species dominance can lead to long-term shifts in plant community composition and structure. Repeated treatments over time could favor herbicide-tolerant species, which in turn could shift pollinators available to a community. DiTomaso (2001) points out that continuous broadcast use of one or a combination of herbicides will often select for tolerant plant species. Population shifts through repeated use of a single herbicide may also reduce plant diversity and cause nutrient changes. A variety of integrated treatments and only using a one-time application followed by spot treatments and prescribed fire would most likely avoid adverse impacts to native plant diversity.

Kennedy et al. (1999) summarized studies related to biodiversity and ecosystem functioning. Recent theoretical models predict that decreasing plant diversity leads to lower plant productivity. These models also showed diversity and composition are equally important determinants of ecosystem functioning. Maintaining biodiversity is often one of the primary

goals of ecosystem management. Reductions in diversity may destabilize trophic dynamics, alter wildlife populations, and change nutrient cycles or decomposition rates (Alpert et al., 1997).

The degree of mortality of native species depends on the herbicide used and the application method, and rate and frequency. As discussed earlier, the herbicides to be used range in their effects on plant species. Of the proposed application methods, aerial application is most likely to affect non-target native plants. This is because this method broadcasts herbicide to all plants in the treatment area. Also, drift can affect plants outside the treatment area. However, protection measures would be taken to minimize drift. Spot applications with backpack sprayers or truck-mounted sprayers focus the herbicide on the target species with limited treatment to adjacent non-target vegetation. These methods would affect native species the least. Because only a small portion of the overall treatment area would receive herbicide applications, the impacts to common native plants would be insignificant as they relate to species abundance, distribution, and population viability on Eglin AFB.

The Proposed Action would, in the short term, affect more native plants (especially with broadcast application of herbicides by aerial application). In the long term, this alternative would protect more native plants and plant communities. Being able to treat a large number of infested acres would greatly improve the probability of controlling many of the INPS currently found on Eglin AFB.

Fauna

Mayer and Ellersieck (1986) reviewed 4,901 acute toxicity tests of over 400 herbicides stored in the database of the USFWS, to determine if there were any statistically valid trends that could be used to compare the 66 species studied. They found there is no single species, family, or class that, in all cases, is most sensitive to chemicals. They agreed with the conclusions of others, that species best represent themselves and not others, but they also observed it was somewhat common that insects were more sensitive to most herbicides than crustaceans, followed by fish, then amphibians. Insects and amphibians, however, have been inconsistently studied, making it difficult to determine any pattern of statistical significance (USDAFS, 2006). More recent studies have looked at amphibians as the most sensitive species due to amphibian anatomy simplifying uptake of many toxicants and recent trends in population declines.

The potential for herbicide application from the Proposed Action to adversely impact faunal species is as follows:

- Faunal species could be exposed to herbicides from surface runoff, subsurface flow, and contaminated groundwater.
- Physical and chemical changes to the structure and function of ecosystems may alter the quality and quantity of faunal species habitat.
- Life cycle interference with potential impacts could reduce the breeding success or viability of the animal population.
- Species toxicity with potential impacts to the degree to which a chemical can harm an organism including biochemical and enzyme function interference and/or organ damage.

- The short- and long-term interaction of the chemicals with soil constituents also directly influences the propensity of the chemicals to adversely impact the species and/or its habitat.

Herbicide Toxicity to Terrestrial Mammals, Birds, and Reptiles

Terrestrial animals may be exposed to herbicides in several ways, including direct spray application, ingestion of plants or other items that have been sprayed, grooming, and indirect contact with vegetation that has been sprayed or inhalation of spray. Wildlife may come in contact with contaminated vegetation or ingest contaminated vegetation or prey.

Pesticides have been identified as a major cause of mortality for numerous species. Organophosphorus and carbamate insecticides are currently the chemicals most commonly associated with mass mortality of wildlife, especially migratory birds (Vyas, 1999). The herbicides proposed for use on Eglin AFB are made up of different chemical compounds, most of which are fairly inert (Table 2-2). The effects of many herbicides on mammalian and avian wildlife have not been studied in detail, although most herbicides have been tested on laboratory animals (especially rats, mallard ducks, bobwhite quails, mice, rabbits, and dogs). Findings are then extrapolated to wildlife, which means that conclusions regarding the effects of these chemicals on wildlife are somewhat uncertain. However, risk levels for herbicide use are calculated in a very conservative manner, and worst-case exposure scenarios have been studied for most herbicides (USDAFS, 2006).

The high tolerance of animals to herbicide residues and the lack of significant accumulation of residues in animals or their environment indicates that health and reproductive success should not be directly affected by herbicide application – numerous studies have shown this to be the case in both field and laboratory experiments (Morrison and Meslow 1983). Table 4-3 and the text that follows the table illustrate this point. As mentioned in Chapter 3, acute toxicity is commonly measured by the lethal dose (LD) that causes death in 50 percent of treated laboratory animals. LD_{50} indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). Chemicals are highly toxic when the LD_{50} value is small and practically nontoxic when the value is large. It should also be noted that the LD_{50} amounts in Table 4-3 were fed or applied to the animals all at once, not over a period of time.

As discussed at the beginning of the Biological Resources section, the likelihood of any animal ingesting (and retaining) or getting enough of the herbicide on its skin to kill or cause acute harm is nearly impossible, even when the herbicide is applied at the maximum rate allowable. Despite this variability in LD_{50}, data are sufficient to determine that the herbicides proposed for use under the Proposed Action are generally of low toxicity to mammalian and avian wildlife (Table 4-5).

None of the proposed herbicides have been found to have chronic effects (i.e., cause cancer, birth defects, reproductive problems, or gene mutations) (Table 2-5). Therefore no chronic effects from the herbicides are expected

Table 4-5. Mammalian and Avian Toxicity Risk Assessment

Chemical name	Mammalian toxicity (LD50 in mg/kg body weight)	Avian Toxicity (LD50 in mg/kg body weight)	Risk Assessment
Aminopyralid	very slightly toxic (>5000)	low/moderate (>2250->5556)	There are no acute or chronic risks to non-target endangered or non-endangered birds, wild mammals, and terrestrial invertebrates.
Fluroxypyr	low (>2,000)	low/moderate (>3162)	Fluroxypyr is practically nontoxic to birds and only slightly toxic to small mammals. No chronic effects observed (USEPA 1998).
Fosamine	very slightly toxic (>5000)	very slightly toxic (>5000)	Fosamine ammonium is only "very slightly toxic" to birds and mammals. No chronic toxic effects in adults or birth defects in offspring were reported (Chrzanowski et al. 1979). The dermal toxicity of fosamine, however, falls under the USEPA Category II, indicating the second most severe level of acute toxicity for studies using laboratory animals. Fosamine is also an eye irritant.
Glyphosate	nearly nontoxic (none given) low (1,500->5,000)	nearly nontoxic (3,850) low (1,500->5,000)	Good data on mammalian and avian wildlife; toxic effects very unlikely even at highest allowable application rates.
Imazapic	low (none given)	low (none given)	Most data are from experimental mammals, there is some uncertainty about extrapolating conclusions to wildlife; larger mammals affected more than smaller, however adverse effects to mammals or birds are unlikely under typical or worst-case cases of exposure.
Imazapyr	nearly nontoxic (4,800-5,000) low (none given)	nearly nontoxic (<2,150) low (none given)	Most data are from experimental animals, there is some uncertainty about extrapolating conclusions to wildlife; little data on toxic levels; sufficient data are available to conclude that adverse effects to terrestrial species are unlikely under typical or worst-case cases of exposure.
Metsulfuron methyl	nearly nontoxic (none given) low (>2,000)	nearly nontoxic (<2,150) low (>2,000)	Most data are from experimental mammals, there is some uncertainty about extrapolating conclusions to wildlife; sufficient data are available to conclude that adverse effects to terrestrial species are unlikely under typical or worst-case cases of exposure; may cause weight loss at sub-lethal doses.

Table 4-5. Mammalian and Avian Toxicity Risk Assessment Cont'd

Chemical name	Mammalian toxicity (LD50 in mg/kg body weight)	Avian Toxicity (LD50 in mg/kg body weight)	Risk Assessment
Sulfometuron methyl	low (<5,000 *ppm*) low (none given)	low (<5,620 *ppm*) low (none given)	Very limited data on birds; observable effects to most mammals & birds not expected; possible reproductive effects to some species although evidence is not conclusive.
Triclopyr	slightly toxic (310-713) low (none given)	very low (1,698) low (none given)	Good data for birds and mammals; application rates at or above those normally used not expected to affect terrestrial animals.

Exposure to extremely high levels of most herbicides through direct ingestion or spraying during laboratory studies often lead to death or a variety of sublethal toxic effects, including damage/irritation to the nervous system, kidneys, eyes, skin; inhibition of reproduction; and other problems. However, the doses required to produce such effects were much higher than those wildlife would encounter from application of herbicides in the field even under worst-case scenarios (USDAFS, 2006).

The long-term fate of herbicides in the environment is also a concern. Bioaccumulation is the process by which chemicals enter the food chain from the environment, whereas biomagnification is the increase in concentration of these chemicals from one link in the food chain to the next. Small concentrations of chemicals, from combined effects of these processes, can lead to toxic effects especially for organisms high in the food chain. However, for biomagnification to occur, the chemical must be long-lived, mobile, and fat-soluble. If a chemical is not long-lived, it will break down before entering the food chain. If it is not mobile, such as when it is bonded to soil, it is unlikely that it could be taken up by an organism. If it is water-soluble rather than fat-soluble, it will be excreted by the organism (USDAFS, 2006). The herbicides proposed for use in this project appear to be rapidly excreted and do not accumulate in tissues. Because of this, these herbicides present a low risk for biomagnification.

Some fauna (e.g., deer) may occasionally contact herbicides by ingesting plants that had been sprayed and by dermal absorption following contact with sprayed plants. There is also a chance that some animals could be directly sprayed with herbicide during aerial application. However, the herbicides proposed for use are of low toxicity, and the chance of animals receiving doses large enough to cause toxic effects is minimal. This must be qualified by the fact that there is uncertainty regarding the toxicity of some herbicides and inert ingredients.

Foraging birds could possibly come into contact with treated areas. This section will discuss the potential affects on birds or if nests are found on or near the treated areas. The chances of birds being directly sprayed would be small. The amount of herbicide absorbed would be very low, and toxic effects would be unlikely due to the low toxicity of herbicides proposed for use. However, this must be qualified by the fact that there is uncertainty regarding the toxicity of some herbicides and inert ingredients. The herbicides proposed for use do not appear to bioaccumulate or biomagnify, so the probability of toxic effects to birds resulting from them eating contaminated prey would also be very low.

Toxic effects to reptiles due to the use of herbicides under this alternative are unlikely. Species such as snakes and turtles could occasionally ingest prey or vegetation that had been sprayed with herbicides because they forage in areas that may receive treatment with herbicide. The herbicides proposed for use have not been found to bioaccumulate or biomagnify. The herbicides proposed for use are of low toxicity (Table 4-3), and the chance of these species receiving doses large enough to cause toxic effects is minimal. However, this must be qualified by the fact that there is uncertainty regarding the toxicity of some herbicides and inert ingredients.

The management requirements outlined in Chapter 2 would be implemented as part of the Proposed Action. These measures are intended to ensure that herbicide concentrations would remain at safe levels and, therefore, negative impacts to flora and fauna should not occur. Positive impacts are expected over time because the proposed action would improve habitat quality and biodiversity.

Herbicide Toxicity to Amphibians and Fish

Pesticides (herbicides and insecticides) are among a number of proposed causes for global amphibian declines. Although a sizable database examining effects of pesticides on amphibians exists, the vast majority of these studies focus on toxicological effects (lethality, external malformations, etc.) at relatively high doses (parts per million). Very few studies focus on effects such as endocrine disruption at low concentrations (Hayes et al., 2006). Most studies examine exposures to single chemicals only. Hayes et al. (2006) examined larval growth and development, sex differentiation, and immune function in leopard frogs (*Rana pipiens*) and the effects of the nine-compound mixture on plasma corticosterone levels in male African clawed frogs (*Xenopus laevis*). Although some of the pesticides individually inhibited larval growth and development, the pesticide mixtures had much greater effects. Larval growth and development were retarded, but most significantly, pesticide mixtures negated or reversed the typically positive correlation between time to metamorphosis and size at metamorphosis observed in controls: exposed larvae that took longer to metamorphose were smaller than their counterparts that metamorphosed earlier. The nine-pesticide mixture also induced damage to the thymus, resulting in immunosuppression and contraction of flavobacterial meningitis. The study revealed that these adverse effects may be due to an increase in plasma levels of the stress hormone corticosterone. Although it cannot be determined whether all the pesticides in the mixture contribute to these adverse effects or whether some pesticides are effectors, some are enhancers, and some are neutral, the study revealed that estimating ecological risk and the impact of pesticides on amphibians using studies that examine only single pesticides at high concentrations may lead to gross underestimations of the role of pesticides in amphibian declines (Hayes et al., 2006).

Lyons (2006) indicates man-made endocrine-disrupting chemicals present a threat to biodiversity. Impaired reproduction, damaged brain function, and deficits of the immune system are of particular concern, and it must be recognized that proving the mechanism of action for some chemicals may take decades. Lyons (2006) suggests it is important to enable certain chemicals to be brought under stricter control on the basis of strong suspicion of endocrine disruption or biochemical signaling disruption. The widespread application of pesticides has

attracted the attention of ecologists, and currently there is a struggle to understand the impacts of these chemicals on natural communities.

A diversity of pesticides and their residues are present in a wide variety of aquatic habitats. While pesticides have the potential to affect many aquatic taxa, the impacts on amphibians are of particular concern in the past decade because of the apparent global decline of many species. Pesticides occur in amphibian habitats, and amphibians living with insecticides in these habitats exhibit physiological signatures of these pesticides (i.e., reduced acetylcholine esterase activity (Relyea et al., 2005). There are few rigorous experiments to confirm that pesticides are altering amphibian communities. It has been found that pesticides can have both direct and indirect effects in natural communities, and that these effects critically depend upon the composition of the community (Relyea et al., 2005).

Effects on terrestrial life stages of amphibians must be viewed somewhat differently. It is likely that adult or subadult amphibians within riparian zones will come into direct contact with herbicides during or after application. Chemical contamination was reviewed in Cooke (1981) and others studies (as reported in Maxell, 2000). Effects (although not necessarily from the specific chemicals proposed for use in this document) ranged from mortality to reduced disease resistance, reproductive ability, and morphological abnormalities (Maxell, 2000). While amphibians' vulnerability to chemicals is well documented, there are no data that allow us to effectively define what effects might occur from incidental contact with the herbicides proposed for use in this EA. Many assume that criteria for mammals, birds, and fish will incorporate the protection needed for amphibians (Maxell, 2000). For this analysis, it is assumed some risk to individuals may be present but impacts are not predictable (Table 4-6); therefore, Eglin would increase avoidance and minimization measures for areas that may potentially hold sensitive amphibians (described below under "Sensitive Species").

Table 4-6. Potential Effects to Aquatic Organisms

Chemical Name	Effects to Aquatic Organisms
Aminopyralid	Aminopyralid is practically nontoxic to fish and aquatic invertebrate animals. It does not build up (bioaccumulate) in fish.
Fluroxypyr	The toxicity of fluroxypyr to fish and aquatic invertebrates ranges from slightly toxic to highly toxic depending on the formulation of herbicide.
Fosamine	The toxicity of fosamine ammonium to fish and aquatic invertebrates is low (USEPA 1995). There is no evidence that fosamine bioaccumulates in fish (USEPA 1995).
Glyphosate	Glyphosate is no more than slightly toxic to fish, and practically nontoxic to aquatic invertebrate animals. It does not build up (bioaccumulate) in fish. The Accord and Rodeo formulations are practically nontoxic to freshwater fish and aquatic invertebrate animals. The Roundup formulation is moderately to slightly toxic to freshwater fish and aquatic invertebrate animals due to its premixed nonaquatic surfactant. Glyphosate and its formulations have not been tested for chronic effects in aquatic animals.
Imazapic	Imazapic ranks as a "low risk" herbicide for fish, classed in the same category as glyphosate, clopyralid, dicamba, and metsulfuron methyl. Neither published literature nor the USEPA files include data regarding the toxicity of imazapic to amphibian species. Aquatic organisms appear to be relatively insensitive to imazapic exposure, relative to both direct toxicity and reproductive effects.

Table 4-6. Potential Effects to Aquatic Organisms Cont'd

Chemical Name	Effects to Aquatic Organisms
Imazapyr	Imazapyr and its formulations are low in toxicity to invertebrates and practically nontoxic to fish. Imazapyr is not expected to accumulate or build up in aquatic animals. Imazapyr and its formulations have not been tested for chronic effects in aquatic animals.
Methsulfuron methyl	Metsulfuron methyl is practically nontoxic to fish and aquatic invertebrates. Metsulfuron methyl does not build up (bioaccumulate) in fish.
Sulfometuron methyl	Sulfometuron methyl is slightly toxic to fish and aquatic invertebrates. The potential for sulfometuron methyl to build up in fish tissues (bioaccumulate) is low.
Triclopyr	Triclopyr is low in toxicity to fish. The ester form of triclopyr, found in Garlon 4, is more toxic, but under normal conditions, it rapidly breaks down in water to a less toxic form. Triclopyr does not accumulate in fish. Triclopyr is slightly toxic to practically non-toxic to invertebrates. Triclopyr and its formulations have not been tested for chronic effects in aquatic animals.

Under the Proposed Action, direct contact with herbicides by amphibians will be largely incidental. The broader, more continuous coverage (aerial application) of nonaquatic labeled herbicides will not occur in riparian zones, where sensitive amphibians are likely to be found in large numbers. Ground application consists largely of spot application, reducing risk of exposure for high numbers of individuals. Amphibian species can occur in extremely high densities around water bodies, shortly after they metamorphose from tadpoles into young adults. This situation can pose a risk to relatively large number of individuals during ground application in the riparian zones.

Based on short exposure times and likely concentration levels that are well below those shown to cause adverse effects to aquatic organisms, it is concluded that risk of adverse effects to fish and amphibian species in surface waters is low enough to be considered insignificant.

The management requirements outlined in Chapter 2 (such as adhering to label instructions and maintaining a 300-foot buffer), are intended to ensure that herbicide concentrations in streams remain at safe levels. Thus, significant negative impacts to fish and amphibians are not anticipated.

Sensitive Species

Eglin supports a number of sensitive plant and wildlife species. The Eglin AFB Integrated Natural Resources Management Plan describes all known sensitive species and how each is managed (U.S. Air Force, 2006). Appendix B offers a detailed natural history description of these species. The potentials for herbicide application from the proposed action to adversely impact the sensitive species are the same as described for the flora and faunal species described above. Additional avoidance and minimization measures described below for each species has been identified and would be followed by Eglin AFB. Eglin Natural Resources Section is conducting an ESA Section 7 consultation for potential impacts to protected species for the proposed action.

Sensitive Fish and Amphibians

Risk of impacting sensitive fish and aquatic life stages of amphibians is directly related to possible herbicide contamination of streams, wetlands, and lakes, and the necessity for water quality conditions to allow individuals throughout all life stages of development and maturation to remain healthy. Risk is indirectly related to effects on aquatic insects, used for food, and riparian and upslope vegetation, necessary to maintain many physical elements of desired habitat characteristics.

By adhering to label instructions and protection measures, herbicide concentrations in streams are expected to remain at safe levels and therefore negative impacts to sensitive species or sensitive habitats should not occur. All alternatives would meet water quality standards and maintain beneficial uses of surface water and groundwater resources.

Susceptibilities to chemical treatments are not well defined for amphibian species, as with other aquatic organisms as described in the flora and fauna section above. Their life histories involve both aquatic and terrestrial life stages, making them susceptible to toxicants in both environments. Many amphibians have vascularization in the epidermis of the skin, with little keratinization, simplifying uptake of many toxicants.

While there is uncertainty regarding certain impacts from herbicide use, there are some impacts that are known to be beneficial. The use of herbicides for long-term vegetation control would provide alternate management tools to soil-disturbing vegetation control methods (mowing and bush-hogging), thus decreasing sedimentation potentials that degrade aquatic habitats. The use of herbicides to treat woody species would promote herbaceous ground cover, resulting in decreased soil erosion rates, thus preventing degradation of stream habitats. Additionally, a reduction in intensive surface disturbances such as roller-drum chopping would substantially reduce the possibility of disturbance to sensitive amphibian habitats. The anticipated increase in available understory fuel sources would increase the intensity, frequency, and effectiveness of prescribed burns, thus improving the habitat condition for multiple sensitive species.

As part of the Proposed Action, certain management requirements would be implemented (detailed in Chapter 2). These measures would reduce or avoid negative impacts to sensitive species. A summary of these measures for sensitive amphibian and fish species is below.

- Herbicide applications would not occur within 1,500 feet of ponds and sampling points located within FNAI Category 1 (habitat known to support flatwoods salamanders) or FNAI Category 2 (habitat with strong potential to support flatwoods salamanders) areas. The Natural Resources Section would provide maps showing these areas to applicators.
- Applications of herbicides would not occur within 300 feet of known dusky gopher frog or Florida bog frog habitat.
- A 300-foot buffer would be required for nonaquatic labeled herbicides which are toxic to fish and/or herbicides which are highly mobile and have the potential to contaminate groundwater around designated Gulf sturgeon critical habitat and Okaloosa darter streams.

- Direct application of herbicides to water would be prohibited around designated Gulf sturgeon critical habitat and Okaloosa darter streams.

With the implementation of the measures above, the Natural Resources Section has determined that the application of herbicides for long-term vegetation control on Eglin is not likely to adversely affect the flatwoods salamander, Gulf sturgeon, or Okaloosa darter or negatively affect the Florida bog frog or dusky gopher frog.

Sensitive Terrestrial Mammals, Birds, and Reptiles

As described above, exposure of terrestrial animals to herbicides may result from several actions including direct spray application, ingestion of plants or other items that have been sprayed, grooming, and indirect contact with vegetation that has been sprayed or inhalation of spray. Animals may be susceptible to direct or secondary effects of pesticides including bioaccumulation from prey; however, these chemicals are rapidly metabolized and eliminated from the systems of exposed animals and the herbicides do not tend to bioaccumulate in browsing wildlife. Wildlife may also come in contact with contaminated vegetation, but by adhering to label instructions and protection measures, herbicide concentrations are expected to remain at safe levels and therefore negative impacts to sensitive species should not occur.

Positive impacts are expected over time, because the action would be intended to increase restoration and increase ecological value. Reduction in intensive surface disturbances such as roller-drum chopping could substantially reduce the potential for destroying active and inactive gopher tortoise burrows, which may be used by indigo snakes and other species for refugia. Reductions in hardwood species would allow longleaf pine and understory herbaceous species to flourish—these conditions are favorable for the RCW and other sensitive species that prefer the open, savanna-like conditions of the longleaf pine forest. The anticipated increase in available understory fuel sources would increase the intensity, frequency, and effectiveness of prescribed burns, thus improving the habitat condition for multiple sensitive species (e.g., RCW, gopher tortoise).

Management requirements for sensitive mammal, bird, and reptile species are included as part of the Proposed Action (detailed in Chapter 2). A summary of these measures is provided below.

Herbicide applications would not occur within 1,500 feet of the bald eagle nest site during the breeding season (1 October through 15 May).
Aerial applications of herbicides that are known to cause eye damage would be prohibited, only ground applications of these herbicides would be permitted.

With the implementation of the measures above, the Natural Resources Section has determined that the application of herbicides for long-term vegetation control on Eglin is not likely to adversely affect the bald eagle or RCW or negatively affect the Florida black bear, burrowing owl, or gopher tortoise.

Sensitive Plants

There are numerous sensitive plant species on Eglin AFB. There is the possibility that herbicides could negatively impact sensitive plants. Because most of the rare plant species on Eglin are understory plants, broadcast herbicide use could negatively impact these communities. Targeted herbicide treatments using the Pronone brush bullet, cut and squirt methods, or other targeted methods would minimize collateral damage of the herbicide. The risk of accidentally applying herbicides to rare plants is very low because, in most cases, these sensitive plants are clustered together in sensitive habitats such as seepage slopes or steephead streams. By designating these areas on maps using GPS/GIS, use of inappropriate herbicides in these areas can be easily avoided. Negative impacts to sensitive plant species on Eglin are not anticipated, and in some cases, herbicide use in areas with sensitive plants may actually lead to increasing ecological value in the area.

Sensitive Habitats

Herbicide use in or near sensitive habitats at Eglin AFB could result in both beneficial and harmful impacts. Potential negative impacts include a reduction in understory diversity due to unintentional kill-off of nontargeted species and water quality degradation from runoff. Beneficial effects would include native plant community restoration and INPS control.

ONAs, SBSs, and HQNCs are important for long-term ecological research and as reference conditions for restoration actions on the installation. The ecological qualities of these areas require that management be carried out with a higher level of scrutiny, especially with regard to the high quality herbaceous ground cover and high density of rare species.

Some herbicide use may be beneficial in ONAs, SBSs, and HQNCs for the control of INPS and for the restoration of native plant communities. In Sandhills habitat, such as the Patterson Natural Area, the NRS has used hexazinone to restore RCW habitat, specifically to supplement fire and to get the habitat in a condition where it could be burned (Walker, 2006). INPS control efforts also utilize herbicides, including treatments to control Japanese climbing fern in the Briar Creek Special Natural Area (U.S. Air Force, 2006b).

Previous work at Eglin AFB showed that shrubs in the understory and woody native species like blueberries, bracken fern, gopher apple, and paw paw were negatively affected by broadcast hexazinone (Provencher et al., 2001). Because many of the rare species in these sensitive habitats are understory plants, broadcast herbicide use could negatively impact these communities. Targeted herbicide treatments using the Pronone brush bullet, cut and squirt methods, or other targeted methods would minimize collateral damage of the herbicide.

The primary concern for aquatic sensitive habitats (aquatic preserves, Gulf sturgeon critical habitat, EFH, and any ONAs, SBSs, and HQNCs that contain aquatic elements) is potential water quality degradation from runoff. Table 2-1 provides details on the environmental hazards associated with the proposed herbicides. Restriction of aerial application of nonaquatic label pesticides near these aquatic sensitive habitats would minimize the potential for runoff of harmful herbicides into aquatic environments. Also, timing the application of herbicides to avoid upcoming rain events would minimize runoff potential.

Management requirements would be implemented as part of the Proposed Action and are summarized here. Sensitive habitats would need to be digitized with GPS/GIS, and provided to aerial herbicide applicators for avoidance, unless specifically approved by the NRS. Any treatments in ONAs, SBSs, or HQNCs; or near aquatic preserves, Gulf sturgeon critical habitat, or EFH would require approval from the Eglin Forest Management NRS, including specifics on application method, herbicide type, buffers, and timing. Thus, the Air Force does not anticipate negative impacts to sensitive habitats from long-term vegetation control activities, and sensitive habitats would likely show beneficial response to targeted herbicide use under the guidance of the NRS.

4.4.2 Alternative 1

Impacts to sensitive habitats would be the same as for the Proposed Action, except that under Alternative 1, no aquatic label herbicides would be approved for use on Eglin, resulting in large areas on Eglin that could not be treated. Certain ONAs, SBSs, and HQNCs with aquatic elements may suffer from INPS invasion and habitat deterioration if the application of aquatic label herbicides is not allowed.

4.4.3 No Action Alternative

Under the No Action Alternative, current management practices would continue. Bush-hogging and mowing would continue on test areas, and hexazinone use would continue in sandhills. INPS control and habitat restoration efforts in some ONAs, SBSs, and HQNCs would be hindered due to a lack of available tools to pursue these issues. Habitat quality in some sensitive habitats may deteriorate without the targeted application of herbicides.

4.5 SOCIOECONOMIC RESOURCES

4.5.1 Proposed Action (Preferred Alternative)

There would be no significant negative impacts to socioeconomic resources would this proposed action be implemented. There would be a decrease in the amount of mechanical vegetation control measures such as bush hogging and roller-drum chopping. By necessity, this would reduce the demand for these operators. However, it is expected that these workers would be employed performing other range maintenance activities, further enhancing the ecological and monetary value of Eglin AFB.

In addition, recreation areas may be affected on a short term basis if herbicides were to be applied in or around these areas and temporary closures are required to protect public safety. If specific times of high usage such as various hunting seasons are taken into application planning, no negative impacts would be expected. Long term impacts to public usage within these areas are also not expected from the proposed action.

4.5.2 Alternative 1

There would be no significant negative impacts to socioeconomic factors under this alternative. Potential impacts under Alternative 1 would be the same as those under the Proposed Action.

4.5.3 No Action Alternative

Under the No Action Alternative, none of the herbicides listed in this EA would be approved for use on Eglin AFB. Over-vegetation of test areas which cannot be subjected to mechanical clearing due to current UXO hazards would occur. As a result of this alternative, test missions may need to be relocated to other test areas on Eglin or to facilities other than Eglin AFB. If relocation of testing activities to another base would occur, negative impacts to the economy of the three-county region are possible.

4.6 ENVIRONMENTAL JUSTICE AND RISKS TO CHILDREN

4.6.1 Proposed Action (Preferred Alternative)

The primary risk to children, low income, and minority populations would be the likelihood of short- and long-term exposure to these chemicals and whether low income and minority populations would be affected disproportionately. In the long term, none of these chemicals are reported to bioaccumulate due to the rapid deterioration internally. This has been documented within fish, birds, and mammals, although long-term studies on humans are not known (see Section 2.1) (WSDOT, 2006a-d). However, short-term exposure is a concern. Several of the chemicals including dicamba, triclopyr amine, metasulfuron, and glyphosate can cause moderate-to-severe eye irritation or corrosion if direct contact is made. Of the herbicides under consideration for use, triclopyr amine (Garlon 3A) has the highest potential to affect human populations directly (WSDOT, 2006). This chemical can contain amine formulations that have been documented to cause irreversible eye damage. Mild-to-severe eye and skin irritation has been documented for dicamba, metasulfuron, and glyphosate (WSDOT, 2006a, b, and c). As discussed in Section 4.5, aerial applications of herbicides that are known to cause eye damage would be prohibited and would be applied via ground delivery system if use of these herbicides is approved. It is not expected that children, minority or low income populations would be affected disproportionately. Application of the chemicals would be guided by label instructions and management practices and the proper application of herbicides by licensed, trained and permitted pilots. With implementation of these guidelines, no impacts are expected.

4.6.2 Alternative 1

Under Alternative 1, potential impacts to local populations would be the same as mentioned under the Proposed Action. No negative impacts would be expected to affect the surrounding community.

4.6.3 No Action Alternative

Under the No Action Alternative, none of the herbicides listed in this EA would be approved for use on Eglin AFB. As a result, no impacts would be expected to minority or low income populations or children.

4.7 SAFETY

The primary safety issue concerns the health and welfare of the herbicide application personnel while handling and applying herbicides on Eglin AFB. Regarding the general public, safety concerns would pertain to incidental herbicide contact through accidental exposure during herbicide application.

4.7.1 Proposed Action (Preferred Alternative)

No safety impacts are anticipated under the Proposed Action. Herbicide application would take place over the whole Eglin AFB Range. Application methods would include aerial and various ground application and spot-treatment techniques. The concentration at which herbicides would be applied are relatively low, however, contact with concentrate and prolonged exposure to herbicide mixtures can affect the health of applicators if proper safety procedures are not employed. These safety procedures include utilizing personal protective equipment and following handling techniques and requirements prescribed in product labels. Personnel who are certified to apply herbicides have been trained on additional safety and handling techniques and requirements. Only these certified herbicide applicators would be authorized to handle and apply herbicides on Eglin AFB. These certified applicators would also have to follow Eglin safety rules in regard to test areas, air space, and UXO.

Herbicide application would take place on test areas as well as areas open to the public for recreational use (camping, hiking, hunting, etc.). Test areas have access barriers and clear procedures for shutting down the area for testing, as well as procedures to ensure personnel safety during herbicide application, so there should be no impacts to safety in these locations. Some of the interstitial areas are also used for training and have clear barriers preventing the general public from entering the area during training exercises. In these areas, it would be easy to apply the same safety operating procedures as used in the test areas during herbicide application. However, there are some areas on Eglin that do not have closable barriers, such as the area around the Florida Natural Trail. This area is regularly used by the general public for hiking. Areas that are open to the public would need to be shut down during herbicide application and for a period of time after to prevent inadvertent contact. A one-time exposure of herbicide at the concentration that would be applied is not likely to do any physical harm to humans or animals. However, it is against the law for anyone to apply herbicides directly on or through drift to another person, even accidentally (Florida Statutes, Title XXXII, Chapter 487.031, 2006). In order to shut these recreational areas down and ensure that a recreational user does not inadvertently come into contact with herbicide spray or wet residue, Eglin would need to post signs at entrance areas and notify the public of the time and duration of the area closure. See Table 4-7 for information about restricted entry durations and the need for application/hunting considerations for different herbicide formulations.

No impacts to safety are expected under the Proposed Action, given that herbicides would be handled as described on the product labels and applied by a certified/licensed applicator, Eglin's current safety practices would be adhered to, and the following mitigations would be employed:

- For areas used by recreationists or other persons, post signs at the entrances of areas to be treated containing the reason, time, and duration of closure; schedule herbicide application to minimize impacts to hunting.

4.7.2 Alternative 1

Under Alternative 1, all of the herbicides proposed in the Proposed Action would be used except for herbicides that are approved for application to water (i.e., Habitat and Renovate 3). The effects would be the same as under the Proposed Action; therefore, no adverse impacts are expected if herbicides are handled as described on the product labels and applied by a certified/licensed applicator, Eglin's current safety practices are adhered to, and the same mitigations described for the Proposed Action are employed.

Table 4-7. Public Health Considerations for Herbicide Application

Herbicide	Restricted Entry	Application/Hunting Considerations?
Milestone	Do not allow entry for 12 hours or until dry, whichever is longer.	No
Vista	Do not allow entry for 12 hours or until dry, whichever is longer.	Yes
Krenite S	Do not allow entry for 12 hours or until dry, whichever is longer.	No
Accord XRT	Do not allow entry for 4 hours or until dry, whichever is longer.	No
Rodeo	Do not allow entry for 4 hours or until dry, whichever is longer.	No
Plateau	Do not allow entry for 12 hours or until dry, whichever is longer.	No
Arsenal	Do not allow entry for 12 hours or until dry, whichever is longer.	No
Chopper	Do not allow entry for 12 hours or until dry, whichever is longer.	No
Habitat	No	No
Escort XP	Do not allow entry for 4 hours or until dry, whichever is longer.	No
Oust XP	Do not allow entry for 4 hours or until dry, whichever is longer.	No
Garlon 3A	Do not allow entry for 48 hours or until dry, whichever is longest.	Yes
Garlon 4	Do not allow entry for 12 hours or until dry, whichever is longest.	Yes
Garlon 4 Ultra	Do not allow entry for 12 hours or until dry, whichever is longest.	Yes
Renovate 3	Do not allow entry for 48 hours or until dry, whichever is longest.	Yes

Information obtained from BASF, Dow AgroSciences, SePRO, Cerexagri, and DuPont product labels in Appendix E.

4.7.3 No Action Alternative

Under this alternative, only the herbicide hexazinone would be applied to test areas on Eglin (as is the current condition), and safety measures for hexazinone are already in place. Therefore, no additional impacts would occur.

5. CUMULATIVE IMPACTS

5.1 CUMULATIVE IMPACT ANALYSIS PROCESS

According to the CEQ regulations, cumulative impact analysis in an environmental assessment should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7).

40 CFR 1508.7 defines impacts or effects as:

> (a) Direct effects, which are caused by the action and occur at the same time and place.
>
> (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

5.1.1 Past and Present Actions Relevant to the Proposed Action

No present actions that may directly or indirectly cause cumulative effects have been identified that relate to the current activity. However, given the full suite of activities that occur at Eglin on a daily basis, other chemical releases into the environment may periodically occur. These chemical releases may include combustive releases from aircraft or vehicle operations or releases from small, short-term episodes that occur during training or testing activities. In terms of relevant past actions on Eglin AFB, only two relatively recent biological assessments (BAs) concerning the herbicide hexazinone (commercial formulation Velpar) apply. These BAs are:

1. Biological Assessment to Determine Impacts to Federally Listed Species Resulting from the Application of the Forest Herbicide Hexazinone on Interstitial Forest Areas. Biological Assessment for Informal Consultation. Submitted to U.S. Fish and Wildlife Service, Southeast Region. Prepared by SAIC, March 2001.

2. Biological Assessment to Determine Impacts to Federally Listed Endangered Species Resulting from the Application of the Forest Herbicide Hexazinone on Land Test Areas. Biological Assessment for Informal Consultation. Submitted to U.S. Fish and Wildlife Service Southeast Region. Prepared by SAIC, November 2000.

5.1.2 Reasonably Foreseeable Future Actions

There are no known reasonably foreseeable future actions related to the current activity.

5.2 ANALYSIS OF CUMULATIVE IMPACTS

5.2.1 Soils

No present or reasonably foreseeable future actions would have a cumulative impact on soils. The current use of hexazinone as an herbicide on Eglin carries the same cumulative risk as the Proposed Action and Alternative 1. Potential cumulative impacts may occur to soils if repeated applications occur prior to the complete decomposition of previous applications. In areas where repeated applications of herbicides during a one-year span may be necessary, care must be taken to recognize potential buildup of periodically persistent chemicals on a case-by-case basis. This risk of cumulative impacts to soils due to repeated applications should be mitigated somewhat by the warm humid weather typical to the region around Eglin AFB.

5.2.2 Water Resources

Based on current herbicide fate and transport literature and studies of herbicides from the USDA Forest Service, herbicides may migrate to surface water and groundwater. Routine monitoring for contaminants in groundwater by Eglin's compliance section, as well as maintaining buffer zones around surface waters, wetlands, and floodplains, would ensure that no adverse cumulative impacts to water resources are from vegetation maintenance occurring on Eglin from past, present, or future activities.

5.2.3 Air Quality

Eglin AFB currently uses the herbicide hexazinone (9,300 acres were treated over 1991–2000) to control vegetation on portions of Eglin's ranges (U.S. Air Force, 2001). With the implementation of the Proposed Action, additional herbicides would be used on Eglin AFB. The increased use of herbicides would also increase the potential for herbicide drift off-target and the potential for releases to the air during prescribed burns following treatment.

Currently, the levels of emissions from hexazinone are minimal, and the addition of the herbicides in the Proposed Action (Section 4.3) are not expected to increase impacts to regional air quality from herbicide drift or prescribed burning of treated areas.

5.2.4 Biological Resources

No additive and overlapping impacts associated with biological resources by implementing the present future actions would have a cumulative impact on biological resources. Potential cumulative impacts may occur to biological resources (amphibians are of particular concern) if repeated applications occur prior to the complete decomposition of previous applications. Applications of herbicides would follow USEPA labels. This risk of cumulative impacts to biological resources should be mitigated by avoidance and minimization measures.

Approval for the use of other herbicides in addition to hexazinone would allow treatment of more types of vegetation and use in new areas of the installation. The use of the new herbicides in conjunction with current hexazinone use would result in an overall positive effect for sensitive habitats.

5.2.5 Socioeconomic Resources

No present or reasonably foreseeable future actions would have a cumulative impact on socioeconomic resources. It is expected that the usage of these chemicals would not result in a net loss of economic activity on base as many of the personnel who currently operate jobs dealing with mechanical vegetation removal would be reassigned other duties on base. If no net losses of jobs occur as a result of this action, no adverse cumulative impacts to socioeconomic resources from past, present, or future activities of vegetation maintenance occurring on Eglin would be expected.

5.2.6 Environmental Justice and Risks to Children

No present or reasonably foreseeable future actions would have a cumulative impact on environmental justice. Hexazinone has not been reported to be associated with any human death or hospitalized case since 1976. The voluntary accident reporting system has only reported one accidental ingestion of hexazinone since that time (U.S. Air Force, 2000). Procedures that minimize safety risks are currently in place on Eglin AFB test areas and are part of the training for aerial chemical application protocol. If these procedures and additional public notification actions are used on areas open to the general public for recreation, no adverse cumulative impacts to environmental justice resulting from activities of vegetation maintenance occurring on Eglin would be expected.

5.2.7 Safety

No present or reasonably foreseeable future actions would have a cumulative impact on safety. Procedures that minimize safety risks (in regard to herbicide application activities) are currently in place on Eglin AFB test areas. If these procedures and additional public notification actions are used on areas open to the general public for recreation, no adverse cumulative impacts to safety from past, present, or future activities of vegetation maintenance occurring on Eglin would be expected.

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6. PERMITS AND MANAGEMENT ACTIONS

The following is a list of plans, permits, and management actions associated with the Proposed Action. The need for these requirements was identified by the environmental impact analysis process for this EA and was developed through cooperation between the proponent and interested parties involved in the Proposed Action. These requirements are, therefore, to be considered as part of the Proposed Action and would be implemented through the Proposed Action's initiation. The proponent is responsible for adherence to and coordination with the listed entities to complete the plans, permits, and management actions.

6.1 PERMITS AND OTHER REQUIREMENTS

- Coastal Zone Management Act Determination
- ESA Section 7 Consultation with the USFWS

6.2 MANAGEMENT ACTIONS

The proponent is responsible for the implementation of the following management actions.

6.2.1 Water Resources

- Establish appropriate buffer zones along perennial and intermittent streams, wetlands and flowing bodies of water.
- Conduct on-site pesticide handling away from streams, ponds, wells, and roadside ditches, such as tank mixing, loading, and rinsing equipment.
- Where available, check reports of depth to groundwater and avoid application of herbicides to test areas having shallow (10 feet below surface) groundwater.
- Evaluate weather conditions (e.g., temperature, wind speed, and precipitation), equipment capabilities, and pesticide formulations to avoid pesticide drift into the water body buffer zone.
- Herbicide labels and instructions would be adhered to during handling, mixing, and application.
- All herbicide applicators conducting treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator.
- Employ a general 300-foot buffer zone around surface waters, wetlands, and floodplains (unless using an herbicide labeled for water use), or determine the soil erodibility, slope, and surface water width of a particular area and use that information along with the Florida State Division of Forestry Silviculture Best Management Practices Handbook (Appendix F) to create a smaller buffer zone (minimum 35 feet) as appropriate in areas with lower soil erodibility and slope—**only if the buffer is not already predetermined by a sensitive species or habitat**.

6.2.2 Air Quality

To decrease potential for drift, aerial application of herbicides would not occur when wind speeds are greater than 10 miles per hour.

6.2.3 Biological Resources

- Any treatments in ONAs, SBSs, or HQNCs or near aquatic preserves, Gulf sturgeon critical habitat, or EFH would require approval from the Eglin Forest Management NRS, including specifics on application method, herbicide type, buffers, and timing.
- Sensitive habitats would be digitized with GPS/GIS and provided to aerial herbicide applicators for avoidance, unless specifically approved by the Eglin Forest Management NRS.
- Restrict aerial application of nonaquatic label pesticides near aquatic sensitive habitats.
- Time the application of herbicides to avoid upcoming rain events.
- Herbicide labels and instructions would be adhered to during handling, mixing, and application of herbicides including USEPA suggested mitigations.
- Herbicide applicators conducting herbicide treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator.
- During the planning process, Eglin would consider the objectives of the proposed activity and potential impacts actions that disturb the soil surface or impact water quality.
- Planners would help identify sensitive areas and applicable best management practices (BMPs) to be used during herbicide applications.
- Herbicide treatments would continue on an as-needed basis to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance.
- Applicators (including contractors and their staff) would be briefed on any potential endangered species concerns and applicable avoidance and minimization measures before conducting herbicide application activities in endangered species habitat.
- Herbicide applications would not occur within 1,500 feet of ponds and sampling points located within FNAI Category 1 (habitat known to support flatwoods salamanders) or FNAI Category 2 (habitat with a strong potential to support flatwoods salamanders) areas. The Natural Resources Section would provide maps showing these areas to applicators.
- Applications of herbicides would not occur within 300 feet of known dusky gopher frog habitat or known Florida bog frog habitat.
- A 300-foot buffer would be required for nonaquatic labeled herbicides that are toxic to fish and/or herbicides that are highly mobile and have the potential to contaminate groundwater around designated Gulf sturgeon critical habitat and Okaloosa darter streams.

- Direct application of herbicides to water would be prohibited around designated Gulf sturgeon critical habitat and in Okaloosa darter streams.
- Herbicide applications would not occur within 1,500 feet of the bald eagle nest site during the breeding season (1 October through 15 May).
- In the event of ground application of herbicides using mechanized equipment within an RCW cluster, operations would not occur during the RCW nesting season.
- In the event of manual application of herbicides within an RCW cluster, procedures outlined in the consultation for "Hexazinone Application on Interstitial Areas" (September 25, 2001) would be followed or further coordination with the Service would take place.
- Aerial applications of herbicides that are known to cause eye damage would be prohibited—only ground applications of these herbicides would be permitted.

6.2.4 Environmental Justice and Risks to Children

- Proper planning of herbicide application missions would be planned to prevent the release of approved chemicals near populated areas.
- As per safety protocols listed in Sections 6.3.3 and 6.3.5, areas on Eglin used for recreational purposes (hunting, fishing, camping, etc.) would be closed prior to application of herbicides and until applied herbicides have degraded to safe levels (dependant on labeled chemical persistence).

6.2.5 Safety

- Herbicide labels and instructions would be adhered to during handling, mixing, and application.
- All herbicide applicators conducting treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator.
- For areas used by recreationists or other persons, post signs at the entrances of areas to be treated containing the reason, time, and duration of closure.
- Schedule herbicide application so that herbicides minimize impacts to hunting.
- Dispose of or recycle pesticide containers and/or excess pesticides according to local, state, and federal regulations and label requirements.
- Clean up and/or contain any pesticide spill immediately.

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APPENDIX A

AIR QUALITY

AIR QUALITY

This appendix presents an overview of the Clean Air Act (CAA) and the state of Florida air quality program. The appendix also discusses emission factor development and calculations including assumptions employed in the air quality analyses.

Air Quality Program Overview

National Ambient Air Quality Standards:

In order to protect public health and welfare, the U.S. Environmental Protection Agency (USEPA) has developed numerical concentration-based standards or NAAQS for six "criteria" pollutants (based on health-related criteria) under the provisions of the Clean Air Act Amendments of 1970. There are two kinds of NAAQS: primary and secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (40 Code of Federal Regulations [CFR] Part 51).

The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the federal program. The Division of Air Resource Management within the Florida Department of Environmental Protection (FDEP) administers the state's air pollution control program under authority of the Florida Air and Water Pollution Control Act and the Environmental Protection Act.

Florida has adopted the NAAQS except for sulfur dioxide (SO_2). USEPA has set the annual and 24-hour standards for SO_2 at 0.03 parts per million (ppm) (80 micrograms per cubic meter [$\mu g/m^3$]) and 0.14 ppm (365 $\mu g/m^3$), respectively. Florida has adopted the more stringent annual and 24-hour standards of 0.02 ppm (60 $\mu g/m^3$) and 0.1 ppm (260 $\mu g/m^3$), respectively. In addition, Florida has adopted the national secondary standard of 0.50 ppm (1,300 $\mu g/m^3$). Federal and state of Florida ambient air quality standards are presented in Table A-1.

Based on measured ambient air pollutant concentrations, the USEPA designates areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS and unclassifiable. Those areas that cannot be classified on the basis of available information as meeting or not meeting the NAAQS for a particular pollutant are "unclassifiable" and are treated as attainment until proven otherwise. Attainment areas can be further classified as "maintenance" areas. Maintenance areas are those areas previously classified as nonattainment and have successfully reduced air pollutant concentrations below the standard. Maintenance areas are under special maintenance plans and must operate under some of the nonattainment area plans to ensure compliance with the NAAQS. All areas of Florida are in compliance with the NAAQS.

Each state is required to develop a state implementation plan (SIP) that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain

the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

Table A-1. National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Federal Primary NAAQS(8)	Federal Secondary NAAQS (8)	Florida Standards
Carbon Monoxide (CO)	8-hour(1)	9 ppm (10 mg/m^3)	No standard	9 ppm (10 $\mu g/m^3$)
	1-hour(1)	35 ppm (40 mg/m^3)	No standard	35 ppm (40 $\mu g/m^3$)
Lead (Pb)	Quarterly	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$)
Particulate Matter ≤10 Micrometers (PM_{10})	Annual(2)	Revoked	Revoked	50 $\mu g/m^3$
	24-hour(3)	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
Particulate Matter <2.5 Micrometers ($PM_{2.5}$)	Annual(4)	15 $\mu g/m^3$	15 $\mu g/m^3$	15 $\mu g/m^3$
	24-hour(5)	35$\mu g/m^3$	35 $\mu g/m^3$	65 $\mu g/m^3$
Ozone (O_3)	1-hour(7)	0.12 ppm (235 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)
	8-hour(6)	0.08 ppm (157 $\mu g/m^3$)	0.08 ppm (157 $\mu g/m^3$)	
Sulfur Dioxide (SO_2)	Annual	0.03 ppm (80 $\mu g/m^3$)	No standard	0.02 ppm (60 $\mu g/m^3$)
	24-hour(1)	0.14 ppm (365 $\mu g/m^3$)	No standard	0.10 ppm (260 $\mu g/m^3$)
	3-hour(1)	No standard	0.50 ppm (1300 $\mu g/m^3$)	0.50 ppm (1300 $\mu g/m^3$)

Source: USEPA, 2006 (Federal Standards) FAC 62-204.240, 2006 (Florida Standards)

ppm = parts per million

mg/m^3 = milligrams per cubic meter

$\mu g/m^3$ = micrograms per cubic meter

(1) Not to be exceeded more than once per year.

(2) Due to lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM10 standard in 2006 (effective December 17, 2006).

(3) Not to be exceeded more than once per year on average over 3 years.

(4) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$

(5) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 mg/m^3 (effective December 17, 2006)

(6) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(7) (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1. (b) As of 15 June 2005, USEPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas.

(8) Concentration expressed first in the units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25° C and a reference pressure of 760 millimeters of mercury; ppm refers to parts per million by volume.

In attainment areas, major new or modified stationary sources of air emissions on and in the area are subject to Prevention of Significant Deterioration (PSD) review to ensure that these sources are constructed without causing significant adverse deterioration of the clean air in the area. A major new source is defined as one that has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specific major source thresholds: 100 or 250 tons/year based on the source's industrial category. A major modification is a physical change or change in the method of operation at an existing major source that causes a significant "net emissions increase" at that source of any regulated pollutant. Table A-2 provides a tabular listing of the PSD significant emissions rate (SER) thresholds for selected criteria pollutants (USEPA, 1990). (PSD SER and increment thresholds have been established for PM_{10}, but not for $PM_{2.5.}$) It should be noted that mobile source emissions as well as those associated with construction activities are excluded from the PSD applicability process.

The goal of the PSD program is to: 1) ensure economic growth while preserving existing air quality, 2) protect public health and welfare from adverse effects which might occur even at pollutant levels better than the NAAQS, and 3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas. Sources subject to PSD review are required by the CAA to obtain a permit before commencing construction. The permit process requires an extensive review of all other major sources within a 50-mile radius and all Class I areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using best available control technology. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase identified in Table A-3. National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development.

Table A-2. Criteria Pollutant Significant Emissions Rate Increases Under PSD Regulations

Pollutant	Significant Emissions Rate (tons/year)
PM_{10}	15
Total Suspended Particulate (TSP)	25
SO_2	40
NO_x	40
Ozone (VOCs)	40
CO	100

Source: Title 40 CFR Part 51
VOCs = volatile organic compounds

Table A-3. Federal Allowable Pollutant Concentration Increases Under PSD Regulations

Pollutant	Averaging Time	Maximum Allowable Concentration ($\mu g/m^3$)		
		Class I	Class II	Class III
PM_{10}	Annual	4	17	34
	24-hour	8	30	60
SO_2	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
NO_2	Annual	2.5	25	50

Source: Title 40 CFR Part 51.
$\mu g/m^3$ = micrograms per cubic meter

Florida has a statewide air quality-monitoring network that is operated by both state and local environmental programs *(*FDEP, 2003*).* The air quality is monitored for carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The monitors tend to be concentrated in areas with the largest population densities and not all pollutants are monitored in those areas. The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards; also included are areas where the ambient standards are being met but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The end-result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality exceedances of the NAAQS as well as pollutant trends. Currently, the state of Florida is attainment for all criteria pollutants.

Regulatory Comparisons

In order to evaluate the air emissions and their impact to the overall ROI, The emissions associated with the construction activities were compared to the total emissions on a pollutant-by-pollutant basis for the ROI's 1999 NEI data. Potential impacts to air quality are then identified as the total emissions of any pollutant that equals 10 percent or more of the ROI's emissions for that specific pollutant. The 10 percent criteria approach is used in the General Conformity Rule as an indicator for impact analysis for nonattainment and maintenance areas and, although the entire state of Florida is attainment, the General Conformity Rule's impact analysis was utilized to provide a consistent approach to evaluating the impact of construction emissions.

To provide a conservative evaluation, the impacts screening in this analysis, used a more restrictive criteria than required in the General Conformity Rule. Rather than comparing emissions from construction activities to regional inventories (as required in the General Conformity Rule), emissions were compared to the individual counties potentially impacted, which is a smaller area.

Project Calculations:

In order to calculate the amount of herbicide expected per acre of land one year following application, several assumptions were made. It was assumed that the maximum application rate listed was used and the longest period of time listed as the half life for each chemical type of herbicide. This provided a worst-case scenario of herbicides that would be burned and potentially emitted to the air.

To calculate the amount of herbicide on-site after 365 days, the following equation was used:

$N(t) = N(0) * 0.5^{t/t1/2}$

Where:
N(t) = Amount of Herbicide remaining after time (*t*) amount of time
N(0) = Initial amount of Herbicide used at time (*t*) equal to zero
t = time elapsed
t1/2 = half-life for the chemical

For example, using the data for glyphosate the following data was used:
N(0) = 8 quarts (qts) (maximum application rate)
t = 365 days
t1/2 = 25 days

Thus,

$N(t) = (8 \text{ qts}) * 0.5^{(365/25)}$
$N(t) = (8 \text{ qts}) * 0.5^{(14.6)}$
$N(t) = (8 \text{ qts}) * (0.0000402)$
$N(t) = 0.0003221 \text{ qts}$

This calculation shows the maximum amount of herbicide that would be on treated sites one year following treatment.

National Emissions Inventory

The National Emissions Inventory (NEI) is operated under USEPA's Emission Factor and Inventory Group, which prepares the national database of air emissions information with input from numerous state and local air agencies, from tribes, as well as from industry. The database contains information on stationary and mobile sources that emit criteria air pollutants and hazardous air pollutants (HAPs). The database includes estimates of annual emissions, by source, of air pollutants in each area of the country on an annual basis. The NEI includes emission estimates for all 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands. Emission estimates for individual point or major sources (facilities), as well as county level estimates for area, mobile and other sources, are available currently for years 1996 and 1999 for criteria pollutants and HAPs.

Criteria air pollutants are those for which USEPA has set health-based standards. Four of the six criteria pollutants are included in the NEI database:

Carbon Monoxide (CO)
Nitrogen Oxides (NO_x)
Sulfur Dioxide (SO_2)
Particulate Matter (PM_{10} and $PM_{2.5}$)

The NEI also includes emissions of volatile organic compounds (VOCs), which are ozone precursors, emitted from motor vehicle fuel distribution and chemical manufacturing, as well as other solvent uses. VOCs react with nitrogen oxides in the atmosphere to form ozone. The NEI database defines three classes of criteria air pollutant sources:

- Point sources – stationary sources of emissions, such as an electric power plant, that can be identified by name and location. A "major" source emits a threshold amount (or more) of at least one criteria pollutant, and must be inventoried and reported. Many states also inventory and report stationary sources that emit amounts below the thresholds for each pollutant.
- Area sources – small point sources such as a home or office building, or a diffuse stationary source, such as wildfires or agricultural tilling. These sources do not individually produce sufficient emissions to qualify as point sources. Dry cleaners are one example, i.e., a single dry cleaner within an inventory area typically will not qualify as a point source, but collectively the emissions from all of the dry cleaning facilities in the inventory area may be significant and therefore must be included in the inventory.
- Mobile sources – any kind of vehicle or equipment with a gasoline or diesel engine, airplane, or ship.

The main sources of criteria pollutant emissions data for the NEI are:

- For electric generating units – USEPA's Emission Tracking System/Continuous Emissions Monitoring Data (ETS/CEM) and Department of Energy fuel use data.
- For other large stationary sources – state data and older inventories where state data were not submitted.
- For on-road mobile sources – the Federal Highway Administration's (FHWA's) estimate of vehicle miles traveled and emission factors from USEPA's MOBILE Model.
- For nonroad mobile sources – USEPA's NONROAD Model.
- For stationary area sources – state data, USEPA-developed estimates for some sources, and older inventories where state or USEPA data were not submitted.
- State and local environmental agencies supply most of the point source data. USEPA's Clean Air Market program supplies emissions data for electric power plants.

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APPENDIX B

BIOLOGICAL RESOURCES

BIOLOGICAL RESOURCES

Federally Listed Species

Flatwoods Salamander

The flatwoods salamander (*Ambystoma cingulatum*) is federally listed as threatened and is a state species of special concern. This small salamander is about 5 inches long with a dark gray back and white streaks on the head, back, limbs, and tail. The belly may be completely black or dark gray or may be covered with white flecks. Optimum habitat for this small mole salamander is open, mesic (moderately wet) woodlands of longleaf or slash pine flatwoods maintained by frequent fires and that contain shallow, ephemeral wetland ponds. Males and females migrate to these ephemeral ponds during the cool, rainy months of October to December. The females lay their eggs in vegetation at the edges of the ponds. Flatwoods salamanders may disperse long distances from breeding sites to upland sites where they live as adults (U.S. Air Force, 2006).

There are 18 known breeding ponds for the flatwoods salamander on the Eglin Range. Additionally, the Eglin Range supports approximately 17,000 acres of potential salamander habitat in mesic flatwoods.

The primary threat to the flatwoods salamander is loss of mesic (moderately wet) habitat through the filling in of wetlands and other alterations to the landscape hydrology. Flatwoods salamander habitat is also threatened by the introduction of invasive, non-native species. Flatwoods salamanders appear to have declined in numbers of individuals and active breeding wetlands since the original surveys in 1993 and 1994. This is possibly due in part to several years of drought in the late 1990s and early 2000s. Breeding wetlands may not have remained wet long enough for larvae to complete metamorphosis if rainfall amounts were not sufficient, resulting in little population recruitment over the last few years at these wetlands (U.S. Air Force, 2006).

The U.S. Fish and Wildlife Service (USFWS) has established a 450-meter (1,476-foot) buffer area from the wetland edge of the confirmed breeding ponds. The USFWS guidelines in the *Federal Register*, dated 01 April 1999, apply restrictions for any ground-disturbing activities within this buffer area to minimize the potential for direct impacts to salamanders, the introduction and spread of invasive non-native plant species, and alterations to hydrology and water quality.

Okaloosa Darter

The Okaloosa darter (*Etheostoma okaloosae*) is considered a federally and state-listed endangered species. Spawning occurs from March to October, with the greatest amount of activity taking place during April (USFWS, 1998). The entire global population of this species is found in the tributaries and main channels of Toms, Turkey, Mill, Swift, East Turkey, and Rocky Creeks, which drain into two bayous of Choctawhatchee Bay. These seepage streams have persistent discharge of clear, sand-filtered water through sandy channels, woody debris, and vegetation beds. The Eglin Range contains 90 percent of the 457-square-kilometer

(176-square-mile) drainage area. The remaining portions of the watershed are within the urban areas of Niceville and Valparaiso (U.S. Air Force, 2006).

The most immediate threat to the Okaloosa darter is loss of habitat through degradation of stream water quality from soil erosion into streams. The areas of high soil and sediment erosion probability are from borrow pits, clay roads that cross streams, and on a few test area sites from vegetation maintenance methods on slopes using choppers. A 1992 study identified erosion from borrow pits and roads as a major contributor to the degradation of darter habitat. Mission activities could avoid further degradation of stream quality by keeping vehicle activity and troop movement confined to rails, bridges, and roads and conducting ground-disturbing activities only outside of a 300-foot buffer around Okaloosa darter streams. These procedures are available to minimize sediment erosion into the darter watersheds and to avoid a consultation process under Endangered Species Act regulations (U.S. Air Force, 2006).

Due to a recovery plan that Eglin AFB implemented for the Okaloosa darter in 1998, the darter is currently under federal status review for potential downlisting from endangered to threatened in 2007. To ensure downlisting of the Okaloosa darter, Eglin AFB is (1) protecting instream flows and historical habitat through management plans, conservation agreements, easements, and/or acquisitions; (2) implementing an effective habitat restoration program to control erosion from roads, clay pits, and open ranges; (3) demonstrating that the Okaloosa darter population is stable or increasing and that the range of the Okaloosa darter has not decreased at all historical monitoring sites; and (4) seeing that no foreseeable threats exist that would impact the survival of the species. The Natural Resources Section (NRS) is about 95 percent complete with erosion control projects in darter watersheds and will soon be entering the maintenance phase (U.S. Air Force, 2006).

Gulf Sturgeon

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a federally listed threatened species and a state-listed species of special concern. This large fish occurs predominately in the northeastern Gulf of Mexico, feeding in offshore areas and inland bays during the winter months and moving into freshwater rivers during the spring to spawn. Migration into fresh water generally occurs from March to May, while migration into salt water occurs from October through November (U.S. Air Force, 2006).

Gulf sturgeon critical habitat was designated in 2003. Federally designated critical habitat is defined as specific areas that contain physical or biological features essential to the species' conservation and that may require special management considerations or protection. As it pertains to the Eglin Range, Choctawhatchee Bay (including main body of Choctawhatchee Bay, Hogtown Bayou, Jolly Bay, Bunker Cove, and Grassy Cove, and excluding all other bayous, creeks, and rivers at their mouths/entrances), Santa Rosa Sound, Yellow River, Shoal River, Blackwater Bay, East Bay, and the Gulf of Mexico out to 1 nautical mile offshore of Santa Rosa Island have been designated as critical habitat. The lower rivers provide summer resting and migration habitat, and the bays, sound, and Gulf contain winter feeding and migration habitat (U.S. Air Force, 2006).

The major mission-related issues for Gulf sturgeon in freshwater and estuarine areas are erosion from test areas and range roads and potential impacts to river and bay bottoms and banks from boats and amphibious vehicles (U.S. Air Force, 2006). The USFWS guidance for habitat preservation is to utilize established landings on the Yellow River for watercraft and avoid scarring of river bottoms and damage to seagrass beds (U.S. Air Force, no date).

Eastern Indigo Snake

The eastern indigo snake (*Drymarchon corais couperi*) is listed as a federal and state threatened species and is the largest nonvenomous snake in North America. The primary reason for its listing is population decline resulting from habitat loss and fragmentation. Movement along travel corridors between seasonal habitats exposes the snake to danger from increased contact with humans. Indigo snakes frequently utilize gopher tortoise burrows and the burrows of others species for over wintering. The snake frequents flatwoods, hammocks, stream bottoms, riparian thickets, and high ground with well-drained, sandy soils. The indigo snake could occur anywhere on the Eglin Range because it uses such a wide variety of habitats (U.S. Air Force, 2006).

The species is extremely uncommon on the Eglin Range with the sighting of only 29 indigo snakes throughout the Eglin Range from 1956 to 1999, while no sightings have been reported since 1999 (Gault, 2006). Most of these snakes were seen crossing roads or after being killed by vehicles. It is difficult to determine a precise number or even estimate of the number of these snakes due to the secretive nature of this species (U.S. Air Force, 2006).

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as a federally threatened species. Eagles are territorial and exhibit a strong affinity for a nest site once a nest has been established. It is common for a breeding pair to rebuild damaged or lost nests in the same tree or in an adjacent tree. Individual pairs return to the same territory year after year and territories are often inherited by subsequent generations. The nesting period in the southeast United States extends from 01 October to 15 May, with most nests finished by the end of November (U.S. Air Force, 2006). Bald eagles nest at one location on the Eglin Mainland Reservation: Eglin Main Base between Cobbs Overrun and Test Area A-22. The pair of eagles at this site has fledged one to two birds per year in most years, but in some years, no young were fledged (U.S. Air Force, 2006).

Eglin AFB follows the USFWS Habitat Management Guidelines for the bald eagle in the Southeast Region, which limits certain types of development within 1,500 feet around the nest but allows some activities outside of the reproduction season (01 October to 15 May) such as logging, land clearing, and construction.

Red-Cockaded Woodpecker

The red-cockaded woodpecker (*Picoides borealis*) is listed as a federally endangered bird species and a state species of special concern. The red-cockaded woodpecker (RCW) excavates cavities in live longleaf pine trees that are at least 85 years old. The RCW historically had a habitat range as far north as New Jersey and as far west as Oklahoma. Today, the RCW has been restricted to the southeastern United States, from Florida to Virginia and to southeast Texas, due to a loss of habitat. In the southeast, 98 percent of the longleaf pine forests have been removed, making federal lands such as Eglin AFB primary habitat for the species. Due to the preservation and continuity of longleaf pine forests on Eglin, the Eglin Range has one of the largest remaining populations of RCWs in the country. In 2003, the USFWS identified Eglin AFB as 1 of 13 primary core populations for the RCW (U.S. Air Force, 2006).

The removal of longleaf pine trees, degradation of quality habitat, or noise generated from mission-related or other activities are potential threats to the RCW on the Eglin Range. Eglin is executing an approved USFWS management strategy to meet certain growth objectives of the RCW and to obtain increased mission flexibility with the federal requirements for RCW impacts (U.S. Air Force, 2006).

The locations of active RCW cavities, which are defined as any tree containing one or more cavities that are utilized by the RCW, are recorded in the Eglin Natural Resources Geographic Information System (GIS). Additionally, inactive RCW cavities, which are defined as those cavities that were once utilized by the RCW but have not shown recent activity, are spatially recorded. The NRS has also mapped the RCW foraging habitat around active clusters of RCW cavities in the GIS. Consultation guidelines require that transient foot and vehicle traffic greater than two hours time be avoided within 200 feet of active RCW trees. No traffic can leave established trails and roads. Digging, excavating, or bivouacking is prohibited within the 200 foot buffer area. In addition, if timber is to be removed within 0.5 miles of active cavity trees, then a forage habitat analysis must be completed to determine potential impacts. Consultation will be required if resulting resources fall below USFWS guidelines.

State Listings and Rare Species

Eglin AFB provides habitat for many state-listed and rare species in addition to the federally listed species described in the previous sections. AFI 32-7064 calls for the protection and conservation of state-listed species when not in direct conflict with the military mission. The conservation of state-listed species and other rare but unlisted species is encouraged and in some cases is critical to ensuring continued mission flexibility. Management actions conducted by Eglin for many of the federally listed species provide direct and indirect benefits to many state-listed and rare species. There are 67 state-listed threatened and endangered species found on Eglin. Most (55) of the 67 state-listed species are plants. An additional 17 animal species are not listed by the Florida Fish and Wildlife Conservation Commission (FWC) or the USFWS but are tracked by the FNAI due to their rarity and/or declining population trends.

Florida Black Bear

The Florida black bear (*Ursus americanus floridanus*) is currently listed as a state threatened species except in Baker and Columbia Counties and Apalachicola National Forest. Florida black bear populations are currently found in Florida and Georgia, with a small population in Alabama. Eglin AFB is considered to be the smallest population, with an estimated 60 to 100 individuals; however, Eglin's black bear population has shown signs of increase since the early 1990s. Reasons for population declines include loss of habitat due to urban development and direct mortality due to collisions with vehicles. Black bear in Florida breed in June–July, and young are born in January-February. Most black bears within the Eglin Range utilize the large swamps and floodplain forests in the southwest and northern portions of the Eglin Range, where they feed on fruits, acorns, beetles, and yellow jackets. Black bear sightings have occurred at numerous locations throughout the Eglin Range, the majority of which have been within the interstitial areas (U.S. Air Force, 2006).

Burrowing Owl

The burrowing owl (*Athene cunicularia floridana*) is a state species of special concern. The owl creates burrows, similar to gopher tortoise burrows, to hide from predators. They are typically found in open habitats with short grasses and few trees. These small owls have been seen on many test areas across the Eglin Range, but the only confirmed population is on Test Area B-70 (U.S. Air Force, 2006).

Gopher Tortoise

The gopher tortoise (*Gopherus polyphemus*), is a state species of special concern but will be uplisted to threatened in the spring of 2007. The tortoise is found primarily within the sandhills and open grassland ecological associations on the Eglin Range. Gopher tortoise burrows serve as important habitat for many species, including the federally listed eastern indigo snake (U.S. Air Force, 2006).

Florida Bog Frog

The Florida bog frog (*Rana okaloosae*), a species of special concern by the state, can only be found within Walton, Okaloosa, and Santa Rosa Counties. Most of the habitat for the frog lies on Eglin AFB property with all known locations of the frog in small tributary streams of the Yellow, Shoal, and East Bay Rivers. There are 65 documented bog frog locations on the Eglin Range, but only 58 of those have been verified.

Southeastern American Kestrel

The southeastern American kestrel (*Falco sparverius paulus*), a state-threatened species, is a common permanent resident of Eglin. This small raptor typically preys on small rodents, reptiles, and insects in clearings or woodland edges. The species can be found within the Sandhills and Open Grassland/Shrubland ecological associations, and may occur on or near any of the test areas at Eglin.

Florida Pine Snake

The Florida pine snake (*Pituophis melanoleucus mugitus*), a state species of concern, inhabits dry areas such as the longleaf pine, oak woodlands, and sand pine scrub communities found within the Sandhills ecological association. The species is physically adapted for digging into loosely packed sand. It also enters into rodent burrows and occasionally into gopher tortoise burrows.

Dusky Gopher Frog

Dusky gopher frogs (*Rana capito sevosa*), a state species of concern, are associated with gopher tortoise habitat, as they use gopher tortoise burrows for cover, but are also known to flourish where the tortoises no longer occur. They will also use Oldfield mouse burrows, hollow stumps, and other holes for cover. The species requires nearby seasonally flooded grassy ponds, depression marshes, and some Sandhills upland lakes that lack fish populations, found within the Sandhills ecological association, for breeding. They have been found in the longleaf pine, turkey oak, pine flatwood, sand pine scrub, and xeric hammock open or forested communities of the Sandhills and Open Grassland/Shrubland ecological associations up to two kilometers from the breeding ponds. Eglin supports the largest known concentration of reproductive sites of the dusky gopher frog subspecies anywhere within its range (FNAI, 1993).

Pine Barrens Tree Frog

The pine barrens tree frog (*Hyla andersonii*), a state species of concern, is a small (~1.5 inch) lime-green frog with a maroon/brown stripe on its sides and a white belly. It is typically found in herbaceous and shrubby bogs of the Wetland/Riparian ecological association, near clear, shallow water along the Blackwater and Yellow Rivers and Choctawhatchee Bay. Breeding, initiated by a repeating call resembling a nasal "quonk," occurs between March and September, with tadpoles emerging between May and August. Stream and water quality degradation and hardwood forest encroachment are the main threats to this species (FNAI, 2001).

Ecological Assets

Ecological Associations

Four broad matrix ecosystems exist on Eglin AFB: Sandhills, Flatwoods, Wetlands/Riparian, and Barrier Island. Three of these are located within the range of influence for long-term vegetation control actions and are described below. The ecosystems are defined by floral, faunal, and geophysical similarities. Artificially maintained open grasslands/shrublands and urban/landscaped areas also exist on Eglin, primarily on test areas or Main Base. Although grasslands/shrublands and urban/landscaped areas are not true ecological associations, they are included in this section as land uses.

Sandhills Matrix

This system is the most extensive natural community type on the Eglin Range, accounting for approximately 78 percent or 362,000 acres of the base. Longleaf Pine Sandhills are

characterized by an open, savanna-like structure with a moderate to tall canopy of longleaf pine, a sparse midstory of oaks and other hardwoods, and a diverse groundcover comprised mainly of grasses, forbs, and low stature shrubs. The structure and composition was maintained by frequent fires, (every 3-5 years), which controlled hardwood, sand pine, and titi encroachment. Longleaf Pine Sandhills consist of a high diversity of species adapted to fire and the heterogeneous conditions that fires create. Variation within the Sandhills is recognized by the two associations differing in the dominance of grass species (wiregrass versus bluestem). Sandhills are often associated with and grade into Scrub, Upland Pine Forest, Xeric Hammock, or slope forests. It is also known as longleaf pine turkey oak, longleaf pine-xerophytic oak, longleaf pine-deciduous oak, or high pine (U.S. Air Force, 2006).

The functional significance of the Sandhill Matrix is to provide maintenance of regional biodiversity. As little as 5,000 acres of old growth longleaf pine forest remains globally and Eglin's sandhills contain more than any other forest in the world. The Eglin Range contains the largest and least fragmented, single longleaf pine ownership in the world, and has the best remaining old growth longleaf pine (U.S. Air Force, 2006).

Flatwoods Matrix

Pine flatwoods occur on flat, moderately well drained sandy soils with varying levels of organic matter, often underlaid by a hard pan. While the canopy consists of slash pine and longleaf pine, the understory varies greatly from shrubby to an open diverse understory of grasses and herbs. The primary environmental factors controlling vegetation type are soil moisture (soil type and depth to groundwater) and fire history. The average fire frequency in flatwoods is one to eight years, with nearly all of the plants and animals inhabiting this community adapted to recurrent fires. Home to numerous rare and endangered plants and animals, the Flatwoods Matrix plays a significant role in maintaining regional biodiversity. Eglin's more than 300 acres of old growth flatwoods are among the last remaining of such high quality (U.S. Air Force, 2006).

Wetlands/Riparian Matrix

Wetlands are extraordinarily important contributors to the health and diversity of the Eglin landscape. Riparian areas are generally found along a water feature such as a river, stream, or creek. Great diversity of invertebrate and fish species is found within the streams associated with these watersheds. At least 11 different plant community types, defined by the State Heritage Program, are found within riparian areas of the Eglin Range. Streams are perennial, originating in the sandy uplands of the installation and fed by groundwater recharge. Flood events only occur during extreme rain events (e.g., hurricanes), otherwise flows are relatively consistent. Temperatures fluctuate during the year and each day, being more constant near the headwaters. These seepage streams are moderately acidic. The specific types of wetlands/riparian matrixes found on or adjacent to the Eglin Range are depression wetlands, seepage slopes, and floodplain wetlands (U.S. Air Force, 2006).

Open Grasslands/Shrublands - Open Grasslands/Shrublands occur in areas of heavily disturbed Sandhills, Flatwoods, and Wetlands/Riparian ecological sites. This habitat predominantly occurs within the test areas on Eglin AFB. Grasses and low shrubs characterize open Grassland/Shrubland areas. Eglin maintains this habitat with machinery or fire that removes or prevents future growth.

Urban/Landscaped Areas - Eglin AFB currently has approximately 46,000 acres of semi-improved areas and 14,000 acres of improved areas. Bahia grass (*Panicum notatum*) is the primary turf grass that is used in the semi-improved areas while St. Augustine grass (*Stenotaphrum secundatum*) and Centipede grass (*Eremochloa ophiuroides*) are the primary turf grasses used in the improved areas. Ground maintenance encourages low maintenance landscaping and uses native plants whenever possible (U.S. Air Force, 2006).

Flora and Fauna of Ecological Associations

Table B-1 provides a summary of some of the plant and animal species commonly found within the ecological associations described above. The list is not a comprehensive inventory of the species found within these ecological associations; the table provides a reference summary.

Table B-1. Typical Plant and Animal Species of Eglin AFB by Ecological Association

Plants		Animals	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Sandhills Ecological Association			
Long Leaf Pine	*Pinus palustris*	Red-cockaded Woodpecker	*Picoides borealis*
Turkey Oak	*Quercus laevis*	Bobwhite Quail	*Colinus virginianus*
Blackjack Oak	*Q. marilandica*	Great Horned Owl	*Bubo virginianus*
Bluejack Oak	*Q. incana*	Gopher Tortoise	*Gopherus polyphemus*
Wiregrass	*Aristida stricta*	Indigo Snake	*Drymarchon corais*
Saw Palmetto	*Serona repens*	Diamondback Rattlesnake	*Crotalus adamanteus*
Bracken Fern	*Pteridium aquilinum*	Six-lined Racerunner	*Cnemidophorus sexlineatus*
Blueberry	*Vaccinium* spp.	Florida Black Bear	*Ursus americanus floridanus*
Yaupon	*Ilex vomitoria*	Fox Squirrel	*Sciurus niger*
Gallberry	*Ilex glabra*	Least Shrew	*Cryptodus parva*
Gopher Apple	*Licania michauxii*	Cottontail Rabbit	*Sylvilagus floridanus*
Blackberry	*Rubus cuneifolius*	Pocket Gopher	*Geomys pinetus*
Sand Pine	*Pinus Clausa*	White-tailed Deer	*Castor canadensis*
Pine-woods Bluestem	*Andropogon arctatus*	Feral Pig	*Sus scrofa*
Wiregrass	*Aristida stricta*	Raccoon	*Procyon lotor*
Flatwoods Ecological Association			
Longleaf Pine	*Pinus palustris*	Wood Duck	*Aix sponsa*
Runner Oak	*Quercus pumila*	Red-winged Blackbird	*Agelaius phoenicius*
Saw Palmetto	*Serona repens*	Cotton Mouth	*Agkistridon piscivorus*
St. John's Wort	*Hypericum brachyphyllum*	Flatwoods Salamander	*Ambystoma cingulatum*
Slash Pine	*Pinus elliottii*	River Otter	*Lutra canadensis*
Black Titi	*Cliftonia monophylla*	Beaver	*Castor canadensis*

Table B-1. Typical Plant and Animal Species of Eglin AFB by Ecological Association Cont'd

Plants		Animals	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Flatwoods Ecological Association (Cont'd)			
Milkweed	*Asclepias humistrata*	Florida Black Bear	*Ursus americanus floridanus*
Pitcherplant	*Sarracenia* spp.	Gray Fox	*Urocyon cinereoargenteus*
Wetland and Riparian Ecological Association			
Freshwater			
Yellow Water Lilly	spp.	Raccoon	*Procyon lotor*
Saw Grass	*Cladium jamaicensis*	Florida Black Bear	*Ursus americanus floridanus*
Cattail	*Typha domingensis*	Sherman's Fox Squirrel	*Sciuris niger shermani*
Phragmites	*Phragmites australis*	American Alligator	*Alligator mississippiensis*
White Cedar	*Chamaecyparis thyoides*	Pine Barrens Tree Frog	*Hyla andersonii*
Water Tupelo	*Nyssa biflora*	Five-lined Skink	*Eumeces fasciatus*
Pitcher Plant	*Sarracenis purpurea*	Green Anole	*Anolis carolinensis*
Red Titi	*Cyrilla racemiflora*	Garter Snake	*Thamnophis sirtalis*
Tulip Poplar	*Liriodendrom tulipifera*	Indigo Snake	*Drymarchon corais*
Sweet Bay Magnolia	*Magnolia virginiana*	American Beaver	*Castor canadensis*
Red Bay	*Persea borbonia*	Parula Warbler	*Parula americana*
Wetland and Riparian Ecological Association			
Saltwater			
Black Needle Rush	*Juncus roemerianus*	Periwinkles	*Littorina irrorata*
Salt Marsh Cordgrass	*Spartina alterniflora*	Oyster	*Crassostrea virginica*
Salt Meadow Hay	*Spartina patens*	Gulf Crab	*Calinectes smilis*
Seaside Elder	*Iva imbricata*	Long-nosed Killifish	*Fundulus similis*
Saltgrass	*Distichylis spicata*	Sheepshead Minnow	*Cyprinodon variegatus*
Wax Myrtle	*Myrica certifera*	America Alligator	*Alligator mississippiensis*
Yaupon Holly	*Ilex vomitoria*	Great Blue Heron	*Ardea herodias*
Cattail	*Typha angustifolia*	Belted Kingfisher	*Megaceryle alcyon*
Palmetto	*Serenoa repens*	Raccoon	*Procyon lotor*
Marsh Elder	*Iva frutescens*	Salt Marsh Rabbit	*Sylvilagus aquaticus*

State Aquatic Preserves

The Florida Aquatic Preserves Act (Florida Statutes Sections 253 and 258) established a standardized set of management criteria for all designated aquatic preserves in the state. In the Act, the state identified the need to preserve state-owned submerged lands in areas that have exceptional biological, aesthetic, and scientific value. One of the criteria for inclusion as a state Aquatic Preserve is the characterization of the area as an "Outstanding Florida Water." Florida protects these waters through stricter discharge and use limits.

The 480-acre Rocky Bayou Aquatic Preserve is bordered on the east by Eglin (approximately one-half mile) and is found closest to Test Area D-51. The site is downstream from Test Areas C-52 complex, C-53, C-72, C-74, and C-80 complex. Rocky Creek, Turkey Creek, and several steephead streams originating on Eglin provide direct or indirect freshwater input to this system. The area is used for recreational boating and fishing and is bounded by residential use on the

north shore and state park use on the south shore. The plant communities found within the preserve include slope forests, salt marsh, and floodplain marshes.

Portions of the Yellow River Marsh Aquatic Preserve are found on the west side of Eglin. The Yellow River Marsh Aquatic Preserve encompasses approximately 16,000 acres of the Yellow River drainage, Blackwater Bay, and East Bay, and includes approximately 2,500 acres of the western portion of Eglin. The preserve contains submerged grass communities as well as salt marshes, floodplain marshes, wet flatwoods, and dome swamps.

In open water and seagrass bed habitats, fish species are abundant and include several anadromous species requiring the saltwater/freshwater interface for their life cycle. The preserve provides food, shelter, and habitat for deer, otter, beaver, marsh rabbit, raccoon, numerous shore birds, alligator, snake, turtle, and salamander. It also provides nursery areas for fish and invertebrates. In drier areas of the preserve, there are species such as bobcat, feral hog, fox, squirrel, wild turkey, song birds, osprey, hawk, and owl. Numerous sensitive species occur in the preserve. Plants include the white-topped pitcherplant, Ashe's magnolia, orange azalea, and the panhandle lily. Sensitive animals in the preserve include the Gulf sturgeon and bald eagle.

High Quality Natural Communities

Eglin's contribution to southeastern conservation is evident in its extraordinary biodiversity and the exemplary quality of its many remnant natural communities. While the greater part of the installation is globally significant due to its biodiversity, specific areas exist that are unique due to their high quality examples of natural communities or presence of rare species. These areas were identified by the FNAI through a project funded by the Department of Defense (DoD) Legacy Resource Management Program. Termed HQNCs, these areas are distinguished by the uniqueness of the community, ecological condition, species diversity, and presence of rare species. These high quality areas, totaling 75,266 acres and covering approximately 16 percent of the installation, are tangible examples of the successful restoration actions of Jackson Guard and the compatibility of these communities with most mission activities.

Outstanding Natural Areas

From the HQNCs FNAI identified, 17 larger-scale landscapes containing complexes of these high quality areas and locations of rare species were named ONAs as listed below (U.S. Air Force, 2006).

1) A-77 Outstanding Natural Area
2) Alaqua-Blount Creek Confluence
3) Alice Creek
4) Boiling Creek/Little Boiling Creek
5) Brier Creek
6) East Bay Flatwoods and Scrub Mosaic
7) Live Oak Creek
8) Lower Weaver River
9) Patterson Outstanding Natural Area and Extension

10) Piney Creek
11) Prairie Creek
12) Santa Rosa Island
13) Scrub Pond
14) Spencer Flats Wetlands
15) White Point
16) Whitmier Island
17) Yellow River Basin

Significant Botanical Sites

FNAI also identified 15 SBSs that support rare plants on Eglin as listed below. Large portions of the ONAs and the SBSs overlap one another. Combined, both of these identified areas total 43,210 acres, or approximately 9 percent of the installation (U.S. Air Force, 2006).

1) East Bay Savannahs
2) Patterson Natural Area Expansion
3) Santa Rosa Island
4) Blue Spring Creek Lakes
5) Malone Creek
6) Titi Creek Wilderness Area
7) Live Oak Creek
8) Turkey Gobbler Creek Cypress Swamp
9) Turkey Hen Creek Swamp
10) Boiling Creek and Little Boiling Creek
11) Hick's Creek Prairie
12) Whitmier Island
13) Brier Creek
14) Hickory Branch Hardwood Forest
15) Piney Creek

Gulf Sturgeon Critical Habitat

Gulf sturgeon critical habitat was designated in 2003. Federally designated critical habitat is defined as specific areas that contain physical or biological features essential to the species' conservation and that may require special management considerations or protection. As it pertains to the Eglin Range, Choctawhatchee Bay (including main body of Choctawhatchee Bay, Hogtown Bayou, Jolly Bay, Bunker Cove, and Grassy Cove, and excluding all other bayous, creeks, and rivers at their mouths/entrances), Santa Rosa Sound, Yellow River, Shoal River, Blackwater Bay, East Bay, and the Gulf of Mexico out to 1 nautical mile offshore of Santa Rosa Island have been designated as critical habitat. The lower rivers provide summer resting and migration habitat, and the bays, sound, and Gulf contain winter feeding and migration habitat (U.S. Air Force, 2006).

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act require, among other things, that the NMFS and regional Fishery Management Councils designate EFH for species included in a fishery management plan. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies that fund, permit, or carry out activities that may adversely affect EFH are required to consult with NMFS regarding potential impacts, and respond in writing to NMFS and Fishery Management Council recommendations. Adverse impacts are defined as impacts that reduce quality and/or quantity of EHF, and may include contamination, physical disruption, loss of prey, and reduction in species' fecundity. The management of sensitive habitats on Eglin is the responsibility of the Natural Resources Section. EFH present in the area includes emergent vegetation and submerged aquatic vegetation (seagrasses).

Emergent Vegetation

Emergent vegetation species occur in isolated locations in Choctawhatchee Bay and Santa Rosa Sound and East Bay as areas of saltmarsh and beach vegetation. North Florida marshes typically support *Juncus roemerianus* (black needle rush), *Spartina* sp. (smooth cordgrass), *Distichlis spicata*, *Scirpus* spp., *Salicornia* spp., and *Phragmites australis* among others. The primary occurrence of emergent vegetation at the proposed action locations appears to be primarily a wetland or beach component and not as fish habitat, since inundation by marine or estuarine waters occurs only during storm events. As such, the areas at the Choctawhatchee Bay locations (i.e. White Point and TA D-84) are technically considered wetland and are not providing fish habitat. As a result, this area is addressed in this document as a part of the wetland environment.

Seagrasses

The Florida Marine Research Institute estimates total seagrass coverage in Choctawhatchee Bay and the Okaloosa County portion of Santa Rosa Sound at 4,160 acres (Sargent et al., 1995). The seagrass bed nearest to any of the activities occurs approximately 3,000 feet to the east of Wynnhaven Beach. Seagrass generally does not occur in East Bay.

Invasive and Exotic Species Management

Invasive nonindigenous species include plants, animals, insects, diseases, and other organisms that are becoming established and spreading at an alarming rate throughout the world. An invasive species can be defined as a species that is non-native to an ecosystem and whose intentional or accidental introduction causes or is likely to cause environmental or economic damage or harm to human health.

The Eglin AFB Invasive Non-native Species Management Program focuses on invasive non-native plant and animal species that cause or may cause negative environmental impacts to Eglin ecosystems. The programs purpose is to protect the integrity of Eglin's natural ecosystems by reducing and controlling the spread of invasive, exotic plant and animal species. It is important that foot traffic and vehicle traffic be minimized in these areas to prevent the spread of the invasive and exotic species. Equipment moving through these areas needs to be washed so

that all seedlings are removed before the equipment is transferred to a noncontaminated area. Standard operating procedures dictate that all vehicles are cleaned prior to use, which would eliminate the potential for the spread of invasive exotic plant species. The Eglin AFB Threatened and Endangered Species Component Plan (U.S. Air Force, 2006a) provides additional detail on invasive species management.

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APPENDIX C

COASTAL ZONE MANAGEMENT ACT AND AGENCY COORDINATION

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION

Introduction

This document provides the State of Florida with the U.S. Air Force's Consistency Determination under CZMA Section 307 and 15 CFR Part 930 sub-part C. The information in this Consistency Determination is provided pursuant to 15 CFR Section 930.39 and Section 307 of the Coastal Zone Management Act, 16 U.S.C. § 1456, as amended, and its implementing regulations at 15 CFR Part 930.

This federal consistency determination addresses the proposed activities associated with long-term vegetation control on Eglin AFB, FL

Proposed Federal Agency Action:

The Proposed Action involves the approval for and use of various herbicides on Eglin AFB for land test area maintenance, line of site maintenance, helicopter landing zone (HLZ) maintenance, red-cockaded woodpecker (RCW) and native ecosystem restoration, INPS control, and native plant nursery development. The Air Force proposes to use herbicides on Eglin's test areas and interstitial areas to control vegetation including but not limited to live oak, laurel oak, and turkey oak, as well as waxy shrubs such as gallberry, greenbrier and wax myrtle. Eglin AFB occupies approximately 464,000 acres in Santa Rosa, Okaloosa and Walton Counties of the Florida Panhandle (Figure 1). The Eglin Reservation is comprised of approximately 50,000 acres of land test ranges, 385,000 acres of the interstitial areas, and about 25,000 acres in the cantonment area. Eglin's test areas functions as both testing and conventional weapon delivery ranges, providing bombing and gunnery training for pilots in the Air Force, Army, Navy and Marines.

Eglin proposes an increase in the use of herbicides and prescribed fire to manage vegetation on test areas and interstitial areas, restore RCW and native ecosystems, control INPS, and develop a native plant nursery, while concurrently decreasing the use of mechanical control methods (mowing and bush-hogging). The Proposed Action would involve an expansion of the list of approved herbicides beyond the use of hexazinone (Table 1). Herbicide treatments would continue as needed to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance. Aerial application of herbicides is proposed for certain areas on Eglin AFB; current and new mitigations would be required.

Table C-1. Herbicides Proposed for Use on Eglin AFB

Herbicide	Example Trade Names	Half-life
Aminopyralid	Milestone™	30 days
Fluroxypyr	Vista®	36 days
Fosamine	Krenite®	7 days
Glyphosate	Accord® XRT	< 25 days
	Rodeo® (aquatic)	< 14 days
Imazapic	Plateau®	25-142 days
Imazapyr	Arsenal®	25-142 days
	Chopper®	25-142 days
	Habitat® (aquatic)	25-142 days
Metsulfuron	Escort®	7-42 days
Sulfometuron methyl	Oust® XP	30 days
Triclopyr	Garlon® 3a	10-46 days
	Garlon 4 Ultra	10-46 days
	Renovate® 3 (aquatic)	< 4 days

*Note: An example of a common trade name is provided for reference. However, herbicides may have multiple trade names if marketed for different uses and by different companies.

The Proposed Action includes promotion of native groundcover species through use of direct application methods, specific herbicide formulations, and/or application timing. Eglin would implement standard avoidance and minimization measures including: sensitive habitat protection; spill prevention, cleanup, and containment; strict adherence to herbicide labels and instructions during handling, mixing, and application of herbicides; and health and safety precautions.

Application Methods

All herbicide applicators conducting herbicide treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator. Eglin would use the following application methods:

- Manual crew.
- Foliar application (directed foliar application using hand-pump or motorized backpacks).
- Basal bark application.
- Soil spots (basal or grid-pattern).
- Injection (including hack and squirt and the hypo-hatchet), cut-stump, and other ground applications.
- Foliar application (foliar application using spray tanks on vehicles/ATVs/trailers and hoses).
- Broadcast (boomless applicator or spray boom mounted on a tractor, skidder, or other vehicle).
- Strip broadcast applications and aerial applications.
- Helicopter or fixed wing, as allowed by label.

The INPS applicators would be trained in the proper identification of both INPS and native species. An Eglin AFB Endangered Species Biologist would manage and oversee all herbicide contracts for the control of INPS. All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns before conducting herbicide application activities in endangered species habitat; additionally, contract clauses would require endangered species coordination. Herbicide labels and instructions would be adhered to during handling, mixing, and application of all herbicides. Global Positioning System (GPS) files, detailed maps and/or ground-marking, or Geographic Information System (GIS) electronic files would be provided to the applicator to delineate the areas to be treated and places to avoid. For aerial applications, the aircraft would be required to use GPS to determine aerial herbicide application location, pattern, and rate. The aircraft would use a single-pass pattern with no overlap. The applicator would be required to use the Air Force's GPS and GIS electronic files to determine treatment areas and coordinate with the Air Force to ensure compatibility (projection and coordinate system) of the electronic files with the aircraft GPS. Sensitive aquatic areas would not receive herbicide (unless an aquatic label can be used). These areas would be digitized with GPS or GIS, and provided to the applicator. Sensitive areas include water bodies, areas adjacent to water bodies, sites without vegetation, and certain sensitive habitats as determined by the Eglin NRS. Areas to be avoided due to concerns for threatened and endangered species would be identified through coordination with endangered species biologists.

Management Requirements for Herbicide Applications

Eglin AFB personnel would protect the environment during mixing, loading, application, and disposal of herbicides to minimize adverse impacts. Herbicides would not be applied if winds create drift outside the treatment area (generally greater than 10 miles per hour [mph]) or to water saturated soils (unless it is labeled for such use). A spill kit capable of containing and preventing release of these chemicals into adjacent water sources would be available during mixing and loading operations. Water tanks/trucks would be required to obtain water for herbicide mixes, to eliminate the possibility of backflow contamination. Empty containers would be recycled or disposed of in accordance with (IAW) Florida state pesticide and hazardous material laws. Pesticide application would be recorded on DD Form 1532-1 and a copy forwarded to 96 CES/CEOUE within one week of application.

During the planning process, Eglin would consider the objectives of the proposed activity and impacts of actions that may disturb the soil surface or impact water quality. Planners would help identify sensitive areas and applicable Best Management Practices (BMPs) to be used during herbicide applications. The Eglin NRS would help identify terms and conditions of a written contract. Eglin would maintain written records of any natural resources management activity on the land. Plans would consider:

- Current and past land use, such well sites, human occupation, and outdoor recreation.
- Sensitive areas such as perennial and intermittent streams, ephemeral streams or ponds, lakes, ponds, bays, wetlands, steep slopes, highly erosive or hydric soils, active gully systems, etc.
- Regulations and/or permitting requirements.

- Location, type, timing and logistics of each activity.
- A maximum buffer of 300 feet from the bank would be applied based on the most conservative buffer situation applicable (high percent slope, soil erodibility, surface water width/type). However if percent slope, soil erodibility, and surface water width/type are determined for a specific location, a smaller buffer (minimum 35 feet from bank) may be utilized by referring to the Florida Division of Forestry's Silviculture BMP handbook (Appendix F) **only if the buffer is not already pre-determined by a sensitive species or habitat**.

BMPs for Chemical Applications

- Establish appropriate Special Management Zone (SMZ) along perennial and intermittent streams and flowing bodies of water.
- Evaluate weather conditions (e.g., temperature, wind speed, and precipitation), equipment capabilities, and pesticide formulations to avoid pesticide drift into the SMZ.
- Conduct on-site pesticide handling away from streams, ponds, wells, and roadside ditches, such as tank mixing, loading and rinsing equipment.
- Dispose of or recycle pesticide containers and/or excess pesticides according to local, state, and federal regulations and label requirements.
- Clean up and/or contain all pesticide spills immediately.

Practices to Avoid During Chemical Applications

- Applying a pesticide directly to water bodies (streams, lakes, and swamps) unless it is specifically prescribed and labeled for aquatic management.
- Broadcast applications of herbicides within SMZs (unless it is aquatic-labeled).

Federal Consistency Review

Statutes addressed as part of the Florida Coastal Zone Management Program consistency review and considered in the analysis of the proposed action are discussed in the following table.

Pursuant to 15 CFR § 930.41, the Florida State Clearinghouse has 60 days from receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 CFR § 930.41(b). Florida's concurrence will be presumed if Eglin AFB does not receive its response on the 60th day from receipt of this determination.

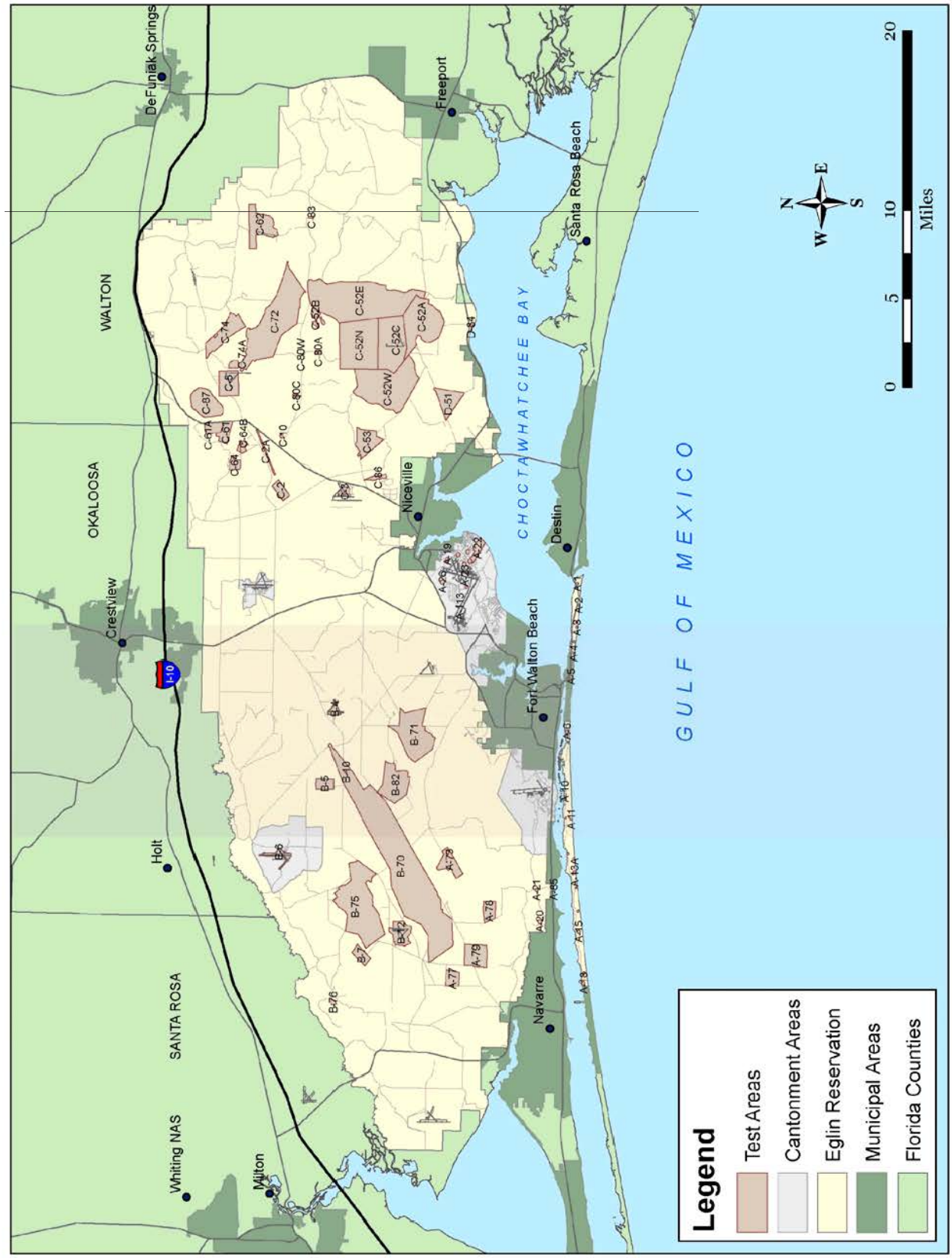

Figure C-1: Overview of Eglin AFB

Table C-2. Florida Coastal Management Program Consistency Review

Statute	Consistency	Scope
Chapter 161 *Beach and Shore Preservation*	The proposed project would not adversely affect beach and shore management, specifically as it pertains to: • The Coastal Construction Permit Program. • The Coastal Construction Control Line (CCCL) Permit Program. • The Coastal Zone Protection Program. All land activities would occur on federal property.	Authorizes the Bureau of Beaches and Coastal Systems within DEP to regulate construction on or seaward of the states' beaches.
Chapter 163, Part II *Growth Policy; County and Municipal Planning; Land Development Regulation*	The proposed action would not affect local government comprehensive plans.	Requires local governments to prepare, adopt, and implement comprehensive plans that encourage the most appropriate use of land and natural resources in a manner consistent with the public interest.
Chapter 186 *State and Regional Planning*	The proposed action would not have a negative affect on state plans for water use, land development or transportation.	Details state-level planning requirements. Requires the development of special statewide plans governing water use, land development, and transportation.
Chapter 252 *Emergency Management*	The proposed action would not increase the state's vulnerability to natural disasters. Emergency response and evacuation procedures would not be impacted by the proposed action.	Provides for planning and implementation of the state's response to, efforts to recover from, and the mitigation of natural and manmade disasters.
Chapter 253 *State Lands*	The proposed action is on Federal property and would not affect state lands or their acquisitions.	Addresses the state's administration of public lands and property of this state and provides direction regarding the acquisition, disposal, and management of all state lands.
Chapter 258 *State Parks and Preserves*	The proposed action would not affect state parks, recreational areas or aquatic preserves.	Addresses administration and management of state parks and preserves (Chapter 258).
Chapter 259 *Land Acquisition for Conservation or Recreation*	The proposed action would not affect tourism and/or outdoor recreation.	Authorizes acquisition of environmentally endangered lands and outdoor recreation lands (Chapter 259).
Chapter 260 *Recreational Trails System*	The proposed action would not affect opportunities for recreation on state lands.	Authorizes acquisition of land to create a recreational trails system and to facilitate management of the system

Table C-2. Florida Coastal Management Program Consistency Review Cont'd

		(Chapter 260).
Chapter 375 *Multipurpose Outdoor Recreation; Land Acquisition, Management, and Conservation*	The proposed action would not affect opportunities for recreation on state lands.	Develops comprehensive multipurpose outdoor recreation plan to document recreational supply and demand, describe current recreational opportunities, estimate need for additional recreational opportunities, and propose means to meet the identified needs (Chapter 375).
Chapter 267 *Historical Resources*	The proposed action would not affect cultural resources.	Addresses management and preservation of the state's archaeological and historical resources.
Chapter 288 *Commercial Development and Capital Improvements*	The proposed action would not have an effect on future business opportunities on state lands, and/or the promotion of tourism in the region.	Provides the framework for promoting and developing the general business, trade, and tourism components of the state economy.
Chapter 334 *Transportation Administration*	The proposed project would not affect transportation.	Addresses the state's policy concerning transportation administration (Chapter 334).
Chapter 339 *Transportation Finance and Planning*	The proposed project would not affect the finance and planning needs of the state's transportation system.	Addresses the finance and planning needs of the state's transportation system (Chapter 339).
Chapter 370 *Saltwater Fisheries*	The proposed action would not affect saltwater fisheries.	Addresses management and protection of the state's saltwater fisheries.
Chapter 372 *Wildlife*	In accordance with Section 7 of the ESA, consultation with the United States Fish and Wildlife Service (USFWS) would be completed prior to project initiation. Eglin has determined that the proposed action is not likely to adversely affect threatened or endangered species found in or around the project area. Activities proposed in and around threatened and endangered species would be performed in accordance with applicable USFWS guidelines. All mitigation measures resulting from Section 7 consultation would be followed, including the observation of appropriate habitat buffers. Herbicides would be used judiciously to help improve the ecological condition of Eglin habitats through the removal of non-native plant species. Special	Addresses the management of the wildlife resources of the state.

Table C-2. Florida Coastal Management Program Consistency Review Cont'd

	Management Zones would be established around known threatened and endangered species areas to reduce the chances of negatively affecting those populations.	
Chapter 373 *Water Resources*	The proposed action would not affect the state's water resources. There would be no significant negative impacts to water resources. Special Management Zones would be established along perennial and intermittent streams, standing water, and flowing bodies of water. No herbicide would be applied directly to water bodies unless it is specifically prescribed and labeled for aquatic management. There would be no broadcast applications of herbicides within the Special Management Zones (if not labeled for aquatic use).	Addresses the state's policy concerning water resources.
Chapter 376 *Pollutant Discharge Prevention and Removal*	Herbicides would be handled per the label instructions and application would occur in accordance with label requirements by a State of Florida certified applicator. Proper safety measures would also be observed in the operation of the delivery and application vehicles (i.e. helicopter, ground vehicles). Pesticide spills would be cleaned up and/or contained immediately. Disposal of pesticide containers and/or excess pesticides would be done according to local, state, and federal regulations and label requirements.	Regulates transfer, storage, and transportation of pollutants, and cleanup of pollutant discharges.
Chapter 377 *Energy Resources*	The proposed action would not affect energy resource production of the state, including oil and gas, or the transportation of oil and gas.	Addresses regulation, planning, and development of energy resources of the state.
Chapter 380 *Land and Water Management*	The proposed action would occur on federally owned lands and there would be no significant negative impacts to surface waters. Special Management Zones would be established along perennial and intermittent streams, standing water, and flowing bodies of water. No herbicide would be applied directly to water bodies unless it is specifically prescribed and labeled for aquatic management. There would be no broadcast applications of herbicides within the Special Management Zones (if not labeled for aquatic use). The proposed action would not affect development of state lands with regional (i.e. more than one county) impacts. The proposed action would not include changes to coastal infrastructure such as capacity increases of existing coastal infrastructure, or use of state funds for infrastructure planning, designing or construction.	Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.
Chapter 381 *Public Health, General Provisions*	The proposed action would not affect public health.	Establishes public policy concerning the state's public health system.
Chapter 388	The proposed action would not affect mosquito control	Addresses mosquito control

Table C-2. Florida Coastal Management Program Consistency Review Cont'd

Mosquito Control	efforts.	effort in the state.
Chapter 403 *Environmental Control*	The proposed action would not negatively affect ecological systems, water quality, air quality, pollution control, solid waste management, or other environmental control efforts. The proposed action would not affect the state's water resources. There would be no significant negative impacts to water resources. Special Management Zones would be established along perennial and intermittent streams, standing water, and flowing bodies of water. No herbicide would be applied directly to water bodies unless it is specifically prescribed and labeled for aquatic management. There would be no broadcast applications of herbicides within the Special Management Zones (if not labeled for aquatic use). There would be no significant negative impacts to air quality. Based on criteria selected (10-percent exceedence of Okaloosa, Santa Rosa, and Walton County Air Emissions), Eglin does not anticipate any adverse impacts to air quality. Herbicides would not be applied if winds create drift outside the treatment area (generally less than 10 mph). All of the herbicides have relatively short half-lives. Application would occur in accordance with label requirements by a State of Florida certified applicator. Herbicides would be used judiciously to help improve the ecological condition of Eglin habitats through the removal of non-native and invasive plant species.	Establishes public policy concerning environmental control in the state.
Chapter 582 *Soil and Water Conservation*	There would be no significant negative impacts to soil. The proposed action would result in a reduction of physical control methods such as roller-drum chopping and bush-hogging thereby reducing the potential for soil erosion. Herbicide spills would be cleaned up and/or contained immediately. Disposal of pesticide containers and/or excess pesticides would be done according to local, state, and federal regulations and label requirements.	Provides for the control and prevention of soil erosion.

05/21/2007 15:30 8502452189 DEP INTERGOV PROGRAM PAGE 01/03

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

March 21, 2007

Mr. J. Mike Nunley, Project Manager
Science Applications International Corp.
1140 North Eglin Parkway
Shalimar, FL 32579

RE: Department of the Air Force – Draft Environmental Assessment, Long-Term Vegetation Control for Eglin Air Force Base – Santa Rosa, Okaloosa, and Walton Counties, Florida.
SAI # FL200703223173C

Dear Mr. Nunley:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the referenced draft environmental assessment (DEA).

The Florida Department of Environmental Protection's (DEP) Office of Coastal and Aquatic Managed Areas (CAMA) has reviewed the referenced DEA for the proposed long-term vegetation control plan. As stated in the Purpose and Need section, the proposed action is necessary to maintain habitats at Eglin AFB to support military testing and training. The DEA states that Eglin AFB proposes to implement an integrated vegetation management program that would support current missions as well as missions in the future. CAMA staff has the following questions regarding the proposal:

- What specific long-term monitoring would be conducted on area surface waters?
- What specific land management best management practices (BMPs) are referenced to develop buffer zones for surface waters when applying herbicides?
- What specific criterion was referenced to determine that the expanded use of herbicides and controlled burning is the best approach versus the mechanical removal of vegetation?
- How will aerial and broadcast herbicide application be monitored? Will this monitoring include ground-truthing to ensure that the herbicides are reaching the identified sites?

1

The DEP's CAMA staff requests that Eglin AFB coordinate with their office on monitoring the watersheds of the Yellow River and Rocky Bayou before, during, and after herbicide applications to document the effects of this method of vegetation control in forested regions adjacent to sensitive aquatic habitats. Please contact Ms. Shelley Alexander, CAMA Northwest Florida Aquatic Preserves in Milton, by phone at (850) 983-5359 or Shelley.Alexander@dep.state.fl.us for future coordination and additional information.

Based on the information contained in the DEA and comments provided by our reviewing agencies, the state has determined that, at this stage, the proposed federal activities are consistent with the Florida Coastal Management Program. The state's continued concurrence with the proposal will be based, in part, on the adequate resolution of issues identified during this and any subsequent reviews.

Thank you for the opportunity to review the proposed project. Should you have any questions regarding this letter, please contact Ms. Lori Cox at (850) 245-2168.

Sincerely yours,

Sally B. Mann

Sally B. Mann, Director
Office of Intergovernmental Programs

SBM/lec
Enclosures

cc: Shelley Alexander, DEP, CAMA

1
2

05/21/2007 15:30 8502452189 DEP INTERGOV PROGRAM PAGE 03/03

Project Information	
Project:	FL200703223173C
Comments Due:	04/26/2007
Letter Due:	05/21/2007
Description:	DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT, LONG-TERM VEGETATION CONTROL FOR EGLIN AIR FORCE BASE - SANTA ROSA, OKALOOSA, AND WALTON COUNTIES, FLORIDA.
Keywords:	USAF - LONG-TERM VEGETATION CONTROL FOR EGLIN AIR FORCE BASE
CFDA #:	12.200

Agency Comments:

ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP's Northwest Florida Aquatic Preserves office staff has reviewed the referenced DEA from the USAF for the proposed plan for long-term vegetation control fro Eglin AFB. As stated in the Purpose and Need section of the report, the proposed action is necessary to maintain habitats at Eglin AFB to support military testing and training. The report states that Eglin AFB proposes to implement an integrated vegetation management program that would support current missions as well as missions in the future. DEP staff has the following questions regarding the proposed project: What specific long-term monitoring would be conducted on area surface waters? What specific land management BMPs are referenced to develop buffer zones for surface waters when applying herbicides? What specific criterion was referenced to determine that the expanded use of herbicides and controlled burning is the best approach versus the mechanical removal of vegetation? How will aerial and broadcast herbicide application be monitored? Will this monitoring include ground-truthing to ensure that the herbicides are reaching the identified sites? DEP requests that Eglin AFB coordinate with their office on monitoring the watersheds of the Yellow River and Rocky Bayou before, during, and after herbicide applications to document the effects of this method of vegetation control in forested regions adjacent to sensitive aquatic habitats. Please contact Ms. Shelley Alexander, CAMA Northwest Florida Aquatic Preserves, by phone at (850) 983-5359 for future coordination and further information.

FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

NO COMMENT BY JOE WALSH ON 3/27/07.

STATE - FLORIDA DEPARTMENT OF STATE

No Comments Received

TRANSPORTATION - FLORIDA DEPARTMENT OF TRANSPORTATION

Released Without Comment

NORTHWEST FLORIDA WMD - NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT

No Comment

WEST FLORIDA RPC - WEST FLORIDA REGIONAL PLANNING COUNCIL

No Comment

OKALOOSA - OKALOOSA COUNTY

SANTA ROSA - SANTA ROSA COUNTY

WALTON -

1
2

Eglin's FDEP Responses emailed to Shelly Alexander on 5-24-07 after phone conference

1. What specific long-term monitoring would be conducted on area surface waters?

Eglin would not conduct water monitoring, which was an error that was not corrected in the Environmental Assessment. Eglin Natural Resources Section believes that with the appropriate BMPs (listed below) and buffers in place, this would greatly reduce the potential that chemicals would affect surface water. Eglin Natural Resources Section does conduct monitoring (see document attached), if there is a concern in the future regarding the use of herbicides, long-term monitoring of surface waters would be considered.

2. What specific land management BMPs are referenced to develop buffer zones for surface waters when applying herbicides?

A maximum buffer of 300 feet from the bank, applied based on the most conservative buffer situation applicable (high percent slope, soil erodibility, surface water width/type). However, if percent slope, soil erodibility, and surface water width/type are determined for a specific location, a smaller buffer (minimum 35 feet from bank) may be utilized by referring to the Florida Division of Forestry's Silviculture BMP handbook **only if the buffer is not already predetermined by a sensitive species or habitat**.

BMPs for Chemical Applications

- Establish appropriate SMZs along perennial and intermittent streams and flowing bodies of water.
- Evaluate weather conditions (e.g., temperature, wind speed, and precipitation), equipment capabilities, and pesticide formulations to avoid pesticide drift into the SMZ.
- Conduct on-site pesticide handling away from streams, ponds, wells, and roadside ditches, such as tank mixing, loading and rinsing equipment.
- Dispose of or recycle pesticide containers and/or excess pesticides according to local, state, and federal regulations and label requirements.
- Clean up and/or contain all pesticide spills immediately.

Practices to Avoid During Chemical Applications

- Applying a pesticide directly to water bodies (streams, lakes, and swamps) unless it is specifically prescribed and labeled for aquatic management.
- Broadcast applications of herbicides within SMZs (unless it is aquatic-labeled).

3. What specific criterion was referenced to determine that the expanded use of herbicides and controlled burning is the best approach versus the mechanical removal of vegetation?

- U.S. Air Force, 2001. Eglin Air Force Base Interstitial Areas, Biological Assessment to Determine Potential Impacts to Federally Listed Species Resulting from the Application of the Forest Herbicide Hexazinone on Eglin's Interstitial Forest Lands. Biological Assessment

Prepared for Informal Consultation by SAIC for the U.S. Fish and Wildlife Service. March 2001.

- U.S. Fish and Wildlife Service, 2001. Concurrence letter from USFWS regarding the biological assessment to determine potential impacts to federally listed species from the application of the forest herbicide hexazinone on Eglin's interstitial forest lands. 25 September 2001.
- U.S. Air Force, 2000. Biological Assessment to Determine Potential Impacts to Federally Listed Endangered Species Resulting from the Application of the Forest Herbicide Hexazinone on Eglin's Land Test Areas. Natural Resources Branch, Jackson Guard, Eglin AFB, Florida. November 2000.
- U.S. Fish and Wildlife Service, 2001. Concurrence letter from USFWS regarding the biological assessment to determine potential impacts to federally listed species from the application of the forest herbicide hexazinone on Eglin's land test areas. 14 June 2001.

Documents available upon request.

4. How will aerial and broadcast herbicide application be monitored? Will this monitoring include ground-truthing to ensure that the herbicides are reaching identified sites?

All chemicals work differently, but the application site will be checked within 2-3 weeks (sometimes after a rain depending on how the herbicide works). The area would be inspected to make sure the herbicide is working on the target species and was applied within the correct location. If sensitive sites are within or on the boundaries of the application, those areas would be checked to make sure there was not a misapplication. A dye may be added to the liquid applications to visibly see the application which would be followed by ground-truthing to ensure the herbicide has reached identified sites. After application, a GPS's "spray file" of the application site and flight routes would be provided. The spray files are cross referenced by ground-truthing after the herbicide takes effect. DOD certified pesticide applicators (aerial and ground herbicide application) will be on site during all applications.

APPENDIX D

USFWS SECTION 7 CONSULTATION DOCUMENTS

Appendix D-1

USFWS Informal Endangered Species Act Section 7 Consultation

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH AIR BASE WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Mr. Stephen M. Seiber
Chief, Eglin Natural Resources
501 De Leon Street, Suite 101
Eglin AFB FL 32542-5133

06 APR 2007

Ms. Janet Mizzi
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City FL 32405

Dear Ms. Mizzi:

The attached biological assessment is being submitted to fulfill requirements under Section 7 of the Endangered Species Act (ESA). This Biological Assessment assesses potential impacts to the bald eagle, Eastern indigo snake, flatwoods salamander, Gulf sturgeon, Gulf sturgeon critical habitat, Okaloosa darter and red-cockaded woodpecker associated with the long-term vegetation control on Eglin Air Force Base (AFB), Florida.

The Proposed Action involves the approval for and use of various herbicides on Eglin AFB for land test area maintenance, line of site maintenance, helicopter landing zone maintenance, red-cockaded woodpecker (RCW) and native ecosystem restoration, invasive nonnative plant species control, and native plant nursery development. The Air Force proposes to use herbicides on Eglin's test areas and interstitial areas to control vegetation including, but not limited to, live oak, laurel oak, turkey oak, and waxy shrubs such as gallberry, greenbrier, and wax myrtle.

The Air Force needs to maintain many of the Eglin AFB land test areas as grassy habitat in order to allow unimpeded observations and lines-of-sight for evaluating munitions tests. The approval of additional herbicides would allow application in all seasons and would allow longleaf restoration in flatwoods and other habitats. The Proposed Action would improve current RCW and ecosystem restoration efforts and reduce sedimentation impacts to the Okaloosa darter.

Eglin Natural Resources section has determined that the Proposed Action is not likely to adversely affect the bald eagle, Eastern indigo snake, flatwoods salamander, Gulf sturgeon, Okaloosa darter, red-cockaded woodpecker and not likely to adversely modify Gulf sturgeon critical habitat. Avoidance and Minimization Measures would serve to significantly mitigate potential impacts from long-term vegetation control activities.

If you have any questions regarding this letter or any of the proposed activities, please do not hesitate to contact either Mr. Bob Miller (850) 883-1153 or myself at (850) 882-8391.

Sincerely,

STEPHEN M. SEIBER, YF-2

Attachment:
Informal Biological Assessment for Long-Term Vegetation Control

EGLIN AIR FORCE BASE
Florida

U.S. FISH AND WILDLIFE SERVICE
INFORMAL ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

FOR

LONG-TERM VEGETATION CONTROL EGLIN AIR FORCE BASE, FLORIDA

APRIL 2007

U.S. FISH AND WILDLIFE SERVICE

INFORMAL BIOLOGICAL ASSESSMENT

FOR

LONG-TERM VEGETATION CONTROL EGLIN AIR FORCE BASE, FLORIDA

Submitted by:

Department of the Air Force
96 CEG/CEVSN
Natural Resources Section
501 DeLeon Street, Suite 101
Eglin AFB, FL 32542-5133

April 2007

PRINTED ON RECYCLED PAPER

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

96 CEG/CEVSN	96th Civil Engineer Group, Natural Resources Section
96 CES/CEOUE	96th Civil Engineer Squadron, Pest Management
AFB	Air Force Base
BA	Biological Assessment
BMP	Best Management Practice
CEG	Civil Engineering Group
DoD	Department of Defense
ESA	Endangered Species Act
FNAI	Florida Natural Areas Inventory
GIS	Geographic Information System
GPS	Global Positioning System
HLZ	Helicopter Landing Zone
HQNC	High Quality Natural Communities
IAW	in accordance with
INPS	Invasive Nonnative Plant Species
LC	Lethal Concentration
LC_{50}	Median Lethal Concentration
LD	Lethal Dose
LD_{50}	Median Lethal Dose
LOAEL	Lowest Observable Adverse Effect Level
LOS	Line-of-Sight
mph	Miles per Hour
NOAEL	No Observable Adverse Effect Level
NRS	Natural Resources Section
ONA	Outstanding Natural Area
RCW	Red-Cockaded Woodpecker
ROCC	Range Operations and Control Center
SBS	Significant Botanical Sites
SMZ	Special Management Zone
SRI	Santa Rosa Island
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance

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1. INTRODUCTION AND BACKGROUND

1.1 PURPOSE AND NEED FOR PROPOSED ACTION

This Biological Assessment (BA), developed by the Eglin Air Force Base (AFB) Natural Resources Section (96 CEG/CEVSN), is meant to fulfill the requirements of the federal Endangered Species Act (ESA) for assessing potential impacts to federally listed species. This consultation addresses the activities associated with long-term vegetation control on Eglin AFB.

The Air Force proposes to implement a vegetation management program on Eglin AFB that integrates the beneficial attributes of a variety of herbicides and prescribed burning techniques for achieving environmentally sound vegetation management while accommodating the performance requirements of test area military missions. The goal of the Proposed Action is to reduce and/or phase out current mechanical vegetation management practices and allow for chemical vegetation management in areas where mechanical means are not possible. The program would reduce vegetation control operation costs, erosion and stream sedimentation, and impacts to sensitive species and habitat associated with land test areas. Also, the Proposed Action would provide Eglin AFB natural resource managers with flexible vegetation management tools to achieve a more natural and diverse forest structure. The desired condition for most of Eglin's forests would be an open longleaf pine savanna with a low-density longleaf overstory, sparse hardwood midstory, and dense ground cover dominated by wiregrass and other native grasses and forbs. Treatment of invasive nonnative plant species (INPS) with a variety of herbicides is also an important aspect in Eglin's long-term vegetation management program.

1.2 PROPOSED ACTION

The Proposed Action involves the approval for and use of various herbicides on Eglin AFB for land test area maintenance, line of site maintenance, helicopter landing zone (HLZ) maintenance, red-cockaded woodpecker (RCW) and native ecosystem restoration, INPS control, and native plant nursery development. The Air Force proposes to use herbicides on Eglin's test areas and interstitial areas to control vegetation including, but not limited to, live oak, laurel oak, turkey oak, and waxy shrubs such as gallberry, greenbrier, and wax myrtle. Eglin AFB occupies approximately 464,000 acres in Santa Rosa, Okaloosa, and Walton Counties of the Florida Panhandle (Figure 1-1). Eglin test areas provide bombing and gunnery testing and training for pilots in the Air Force, Army, Navy, and Marines. The range functions as both a testing and conventional weapon delivery range. The Eglin Range comprises approximately 50,000 acres of land test ranges, 385,000 acres of the interstitial areas, and about 25,000 acres in the cantonment area.

1.3 NEED FOR THE PROPOSED ACTION

The Air Force needs to maintain many of the Eglin AFB land test areas (Figure 1-2) as grassy habitat in order to allow unimpeded observations and lines-of-sight (LOSs) for evaluating munitions tests. Additionally, grassy habitats minimize the effects of munitions-caused wildfires.

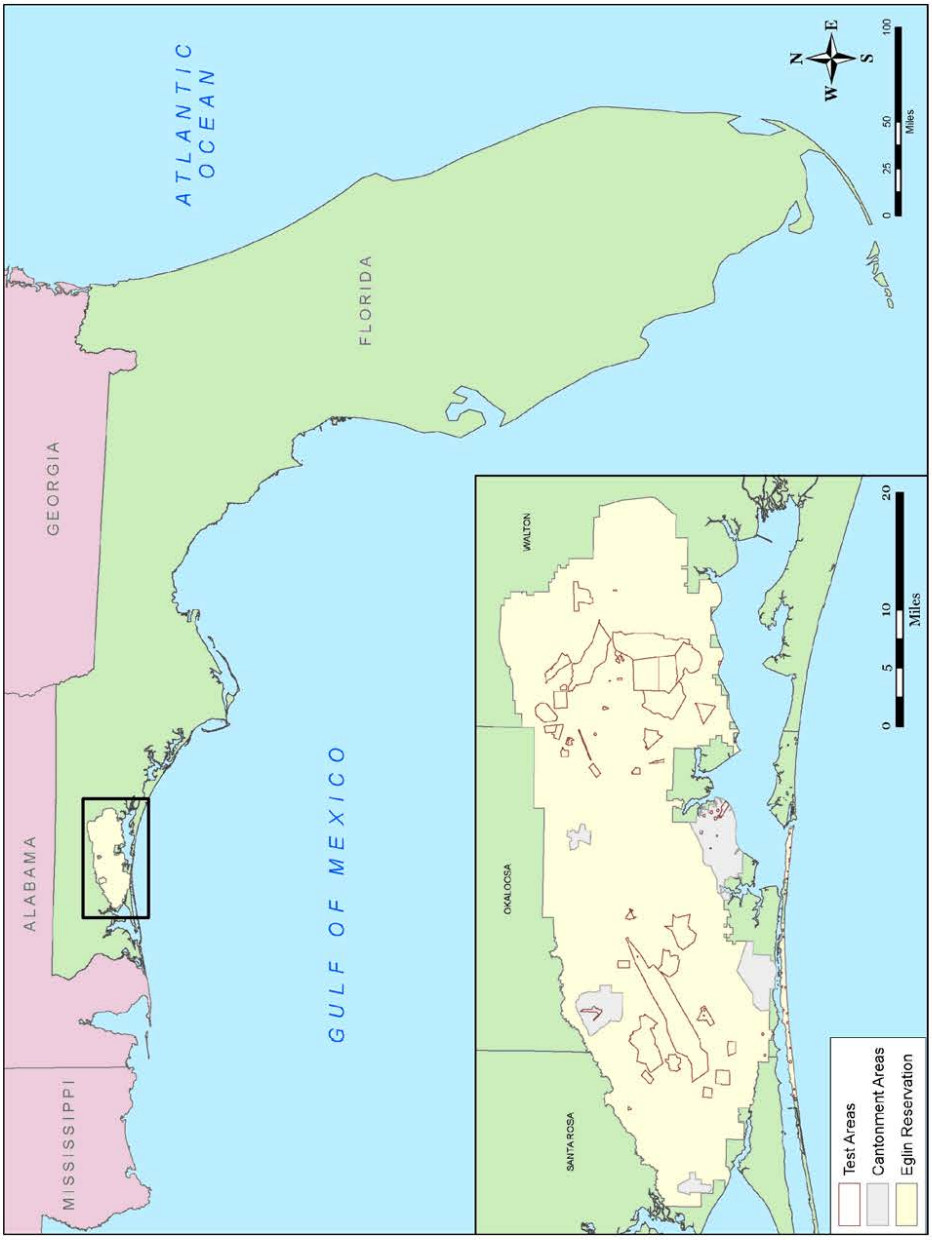

Figure 1-1. Regional Location of Eglin AFB

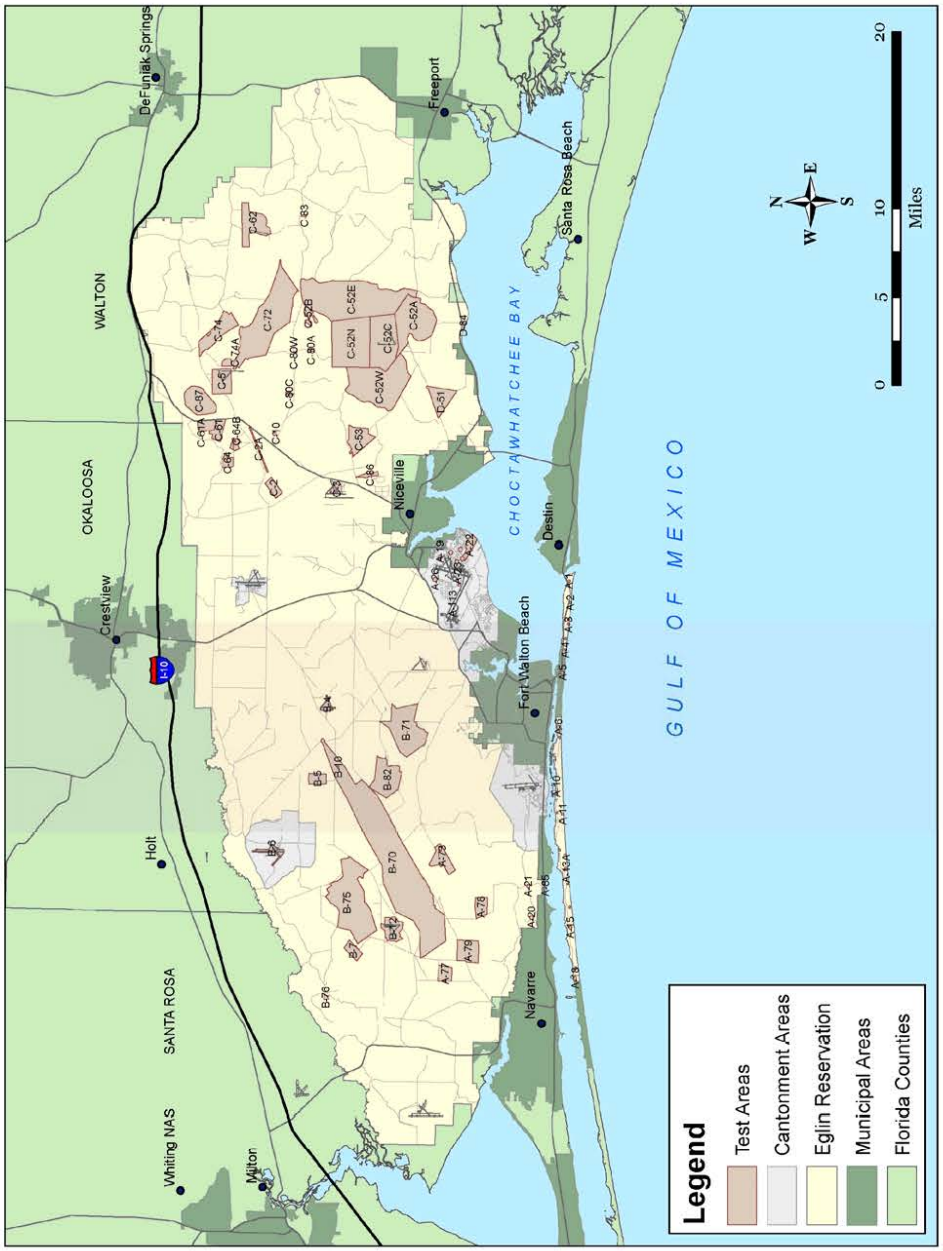

Figure 1-2. Eglin AFB Test Areas

Eglin currently only uses the forest herbicide hexazinone (3-cyclohexyl-6-(dimethylamino)-methyl-1,3,5-triazine-2,4-(1*H*,3*H*)-dione) for test area maintenance. Hexazinone is very effective against oaks but is less effective against pines and other nontarget species, such as gallberry. Hexazinone requires application during the early growing season, and present guidance restricts application to the sandhills. Use of additional types of herbicides would allow Eglin to target other areas and types of vegetation, including vegetation near aquatic areas, vegetation in unexploded ordnance (UXO) areas, waxy species, and pine species. The approval of additional herbicides would allow application in all seasons and would allow longleaf restoration in flatwoods and other habitats where the Air Force does not currently use hexazinone. The Proposed Action would improve current RCW and ecosystem restoration efforts and reduce sedimentation impacts to the Okaloosa darter.

Native groundcover species are an important part of native ecosystems on Eglin, and, therefore, are important to ecosystem restoration. The Eglin AFB Native Grass Operational Plan (U.S. Air Force, 2005) calls for establishment of native plant seed orchards to promote restoration of native ecosystems. The successful establishment of these seed orchards requires the elimination of nonnative sodgrasses and other species, which would involve the use of herbicides.

In the absence of fire or some other method to control undesirable vegetation, native longleaf and slash pine seedlings are often outcompeted by more aggressive species such as sand pine and oaks. Because it is not possible to conduct prescribed burns in some areas, managers need alternative options to control these species. Mechanical vegetation control and ground application of herbicides are labor intensive and costly; aerial herbicide application provides an alternative method at reduced labor and costs (potentially saving $2 million per year) (Seiber, 2006) and also reduce the potential for soil erosion and sedimentation of streams and wetlands.

Without treatment, regeneration of native longleaf and slash pine would be negatively impacted, along with associated native understory species. Healthy longleaf pine forests and native groundcover species are essential for the recovery of federally listed species. Coordinated use of chemical application, mechanical removal, and prescribed burning would be used to reduce aggressive hardwood, pine, and herbaceous species in order to promote sustainable longleaf pine and natural grass communities.

The Natural Resources Section (NRS) of Eglin AFB currently conducts herbicide treatments of all known INPS on Eglin. Once established, INPS reduce biological diversity and disrupt the integrity of native ecosystems by outcompeting native species. This reduction in biological diversity reduces the suitability of the habitat for both plant and animal species. To prevent the spread and infestation of INPS in natural areas, the early detection and rapid response to control them is critical for their long-term management.

1.4 OBJECTIVE OF THE PROPOSED ACTION

The objective of herbicide application on Eglin's test areas is to control target vegetation in order to meet specific program objectives, for example, to observe armament testing or to minimize armament-caused fire. On defined land test areas, the goal is to remove woody vegetation and maintain a grassy herbaceous cover. The objective of herbicide application in sensitive habitats

(such as RCW foraging habitat) across the Eglin Range Complex is to minimize hardwood midstories while favoring longleaf pines and associated groundcover and understory species.

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2. DESCRIPTION OF THE PROPOSED ACTION

Eglin proposes an increase in the use of herbicides and prescribed fire to manage vegetation on test areas and interstitial areas, restore RCW and native ecosystems, control INPS, and develop a native plant nursery, while concurrently decreasing the use of mechanical control methods (mowing and bush-hogging). The Proposed Action would involve an expansion of the list of approved herbicides beyond the use of hexazinone (Table 2-1). Herbicide treatments would continue as needed to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance. Aerial application of herbicides is proposed for certain areas on Eglin AFB; current and new mitigations would be required.

Table 2-1. Herbicides Proposed for Use on Eglin AFB

Herbicide	Example Trade Name*
2,4 D amine	Aqua-Kleen®
Aminopyralid	Milestone™
Fluroxypyr	Vista®
Fosamine	Krenite®
Glyphosate	Accord XRT®
	Rodeo (aquatic) ®
Imazapic	Plateau®
Imazapyr	Arsenal®
	Chopper®
	Habitat® (aquatic)
Metsulfuron methyl	Escort®
Sulfometuron methyl	Oust XP®
Triclopyr	Garlon 3a®
	Garlon 4 Ultra®
	Renovate 3® (aquatic)

*An example of a common trade name is provided for reference. However, herbicides may have multiple trade names if marketed for different uses and by different companies.

The Proposed Action includes promotion of native groundcover species through use of directed application methods, specific herbicide formulations, and/or application timing. The Proposed Action also includes implementing standard avoidance and minimization measures for sensitive habitat protection; spill prevention, cleanup, and containment; strict adherence to herbicide labels and instructions during handling, mixing, and application of herbicides; and health and safety precautions. Environmental hazards posed by herbicides according to the label are listed in Table 2-2. Expanded herbicide use is proposed for the Eglin mainland reservation (excluding areas that would be avoided as identified in this document).

Description of the Proposed Action

Table 2-2. Environmental Hazards (Label)

Herbicide	Example Trade Name	Environmental Hazards (label)
2,4-D amine	Aqua-Kleen	This product is toxic to fish. Drift or runoff may adversely affect fish and nontarget plants. Do not apply to water except as specified on the label. Do not contaminate water when disposing of equipment washwaters. Unless an approved assay indicates the 2,4-D concentration is 100 ppb (0.1 ppm) or less, or only growing crops and noncrop areas labeled for direct treatment with 2,4-D will be affected, do not use water from treated areas for irrigating plants or mixing sprays for agricultural or ornamental plants. Unless an approved assay indicates the 2,4-D concentration is 70 ppb (0.07 ppm) or less, do not use water from treated areas for potable water (drinking water). Clean spreader equipment thoroughly before using it for any other purposes. Vapors from this product may injure susceptible plants. Most cases of groundwater contamination involving phenoxy herbicides such as 2,4-D have been associated with mixing/loading and disposal sites. Caution should be exercised when handling 2,4-D pesticides at such sites to prevent contamination of groundwater supplies.
Aminopyralid	Milestone	Aminopyralid is not toxic to bees and nontoxic to aquatic organisms on an acute basis. Aminopyralid is practically nontoxic to birds on an acute or dietary basis. Based largely or completely on information for aminopyralid, bioconcentration potential for Milestone is low. It is relatively immobile in soil, with most of the chemical remaining within the upper 12 inches of the soil profile. Products containing aminopyralid can not be applied directly to water but can be used to treat banks of ditches or other channels that do not carry water used for irrigation or drinking. Applications should be avoided to areas where movement into water used for irrigation or drinking could occur.
Fluroxypyr	Vista	Toxic to fish. Drift or runoff from treated areas may be hazardous to aquatic organisms and nontarget plants. Do not apply directly to water, to areas where water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
Fosamine	Krenite	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
Glyphosate	Accord XRT	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
	Rodeo (aquatic)	Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.
Imazapic	Plateau	For terrestrial use only. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This chemical demonstrates the properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. This product may contaminate water through drift or spray wind. This product has the high potential for runoff for several months or more after application. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential for contamination of water from rainfall runoff. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours.

Description of the Proposed Action

Table 2-2. Environmental Hazards (Label) (cont'd)

Herbicide	Example Trade Name	Environmental Hazards (label)
Imazapyr	Arsenal	For terrestrial uses. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This herbicide is phytotoxic at extremely low concentrations. Nontarget plants may be adversely affected from drift.
	Chopper	Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This herbicide is phytotoxic at extremely low concentrations. Nontarget plants may be adversely affected from drift.
	Habitat (aquatic)	Do not apply to water except as specified in this label. Treatment of aquatic weeds may result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss may cause the suffocation of some aquatic organisms. Do not treat more than one half of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move to untreated areas. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This pesticide is toxic to vascular plants and should be used strictly in accordance with drift precautions on label.
Metsulfuron	Escort	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely affected from drift and runoff.
Sulfometuron methyl	Oust XP	Do not apply directly to water, or to areas where surface water is present, or intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
Triclopyr	Garlon 3a	Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.
	Garlon 4 Ultra	This product is highly toxic to fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or equipment washwaters. This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.
	Renovate 3 (aquatic)	Under certain conditions, treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants, which may contribute to fish suffocation. Therefore, to minimize this hazard, do not treat more than one-third to one half of the water area in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. Consult with the state agency for fish and game before applying to public water to determine if a permit is needed.

ppb = parts per billion; ppm = parts per million
*Information in this table was obtained from Dow AgroSciences, Cerexagri, Inc., DuPont, SePRO and BASF Material Safety Data Sheets.

Description of the Proposed Action

Herbicides encompass liquid, solid, or gaseous substances that are released to the environment as a result of vegetation maintenance activities. These would include active ingredients as well as adjuvants used in herbicide application. Prior to 1993, the herbicide hexazinone (3-cyclohexyl-6-(dimethhlyamino)-1-methyl-1,3,5-triazine-2,4(1H,3H), was used extensively to control unwanted woody vegetation at Eglin AFB on reforestation areas. Approximately 8,000 acres received a one-time application of the herbicide in dosages less than 5 pounds of active ingredient per acre (U.S. Air Force, 1998a). In the early 1980s, hexazinone was also applied to C-72 and C-52N. Hexazinone, fire, roller drum chopping, and bush-hogging are currently the only vegetation maintenance methods used on Eglin AFB.

2.1 APPLICATION METHODS

All herbicide applicators conducting herbicide treatment activities on Eglin AFB would be Department of Defense (DoD)- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator. Table 2-3 lists the target species and application methods associated with the proposed herbicides. Eglin would use the following application methods:

- Manual crew
- Foliar application (directed foliar application using hand-pump or motorized backpacks)
- Basal bark application
- Soil spots (basal or grid-pattern)
- Injection (including hack and squirt and the hypo-hatchet), cut-stump, and other ground applications
- Foliar application (foliar application using spray tanks on vehicles/ATVs/trailers and hoses)
- Broadcast (boomless applicator or spray boom mounted on a tractor, skidder, or other vehicle)
- Strip broadcast applications and aerial applications
- Helicopter or fixed wing, as allowed by label

The INPS applicators would be trained in the proper identification of both INPS and native species. An Eglin AFB endangered species biologist would manage and oversee all herbicide contracts for the control of INPS. All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns before conducting herbicide application activities in endangered species habitat; alternatively, contract clauses would require endangered species coordination. Herbicide labels and instructions would be adhered to during handling, mixing, and application of all herbicides.

Table 2-3. Target Species of Herbicides and Application Methods

Herbicide	Example Trade Names	*Target Species*						*Application Methods*				
		Broadleaf Weeds	Woody Plants	Annual & Perennial Grasses	Vines and Brambles	Aquatic Plants	Pine	Maximum Application Rate	Season Applied	Treatment		
										Foliar	Basal	Soil
2,4 D amine	Aqua-Kleen	▲						Dependent upon plant species treated	Spring or early summer	▲		
Aminopyralid	Milestone	▲						3-7 ounces per acre per year	Spring or Fall	▲		
Fluroxypyr	Vista	▲	▲					2 2/3 pints per acre per year	Dependent upon plant species treated	▲		
Fosamine	Krenite						▲	3 gallons per acre per year	Mid-summer to late summer/fall	▲		
Glyphosate	Accord XRT	▲	▲					8 quarts per acre per year (total glyphosate)	Dependent upon plant species treated	▲		
	Rodeo (aquatic)	▲	▲					8 quarts per acre per year (total glyphosate)	Dependent upon plant species treated	▲		
Imazapic	Plateau	▲		▲	▲			12 ounces per acre per year	Dormant or growing season	▲		▲
Imazapyr	Arsenal	▲	▲	▲	▲			Dependent upon plant species treated	Dependent upon plant species treated	▲	▲	▲
Imazapyr	Chopper	▲	▲	▲	▲			Dependent upon plant species treated	Dependent upon plant species treated	▲	▲	▲
Imazapyr	Habitat (aquatic)	▲		▲	▲	▲		6 pints per acre per year	Dependent upon plant species treated	▲	▲	▲
Metsulfuron methyl	Escort	▲	▲					4 ounces per acre per year	Dependent upon plant species treated	▲		
Sulfometuron methyl	Oust XP	▲						8 ounces per acre per year	Dependent upon plant species treated	▲		▲

Table 2-3. Target Species of Herbicides and Application Methods (cont'd)

Herbicide	Example Trade Names	*Target Species*						*Application Methods*				
		Broadleaf Weeds	Woody Plants	Annual & Perennial Grasses	Vines and Brambles	Aquatic Plants	Pine	Maximum Application Rate	Season Applied	Treatment		
										Foliar	Basal	Soil
Triclopyr	Garlon 3a	▲	▲					2-3 gallons per acre per year	Dependent upon plant species treated	▲		
	Garlon 4 Ultra	▲	▲					8 quarts per acre per year	Dependent upon plant species treated	▲	▲	
	Renovate 3 (aquatic)	▲	▲			▲		Dependent upon plant species treated	Dependent upon plant species treated	▲		

Information in this table was obtained from Dow AgroSciences, Cerexagri, Inc., DuPont, SePRO, and BASF Material Safety Data Sheets.

Global Positioning System (GPS) files, detailed maps and/or ground-marking, or Geographic Information System (GIS) electronic files would be provided to the applicator to delineate the areas to be treated and places to avoid. For aerial applications, the aircraft would be required to use GPS. The aircraft GPS would be used to determine aerial herbicide application location, pattern, and rate. The aircraft would use a single-pass pattern with no overlap. The applicator would be required to use the Air Force's GPS and GIS electronic files to determine treatment areas and coordinate with the Air Force to ensure compatibility (projection and coordinate system) of the electronic files with the aircraft GPS.

Due to range and air space operations, aerial application requires special approval and coordination with the range air space schedulers, Range Operations and Control Center (ROCC), and Air Traffic Control Tower. Aerial herbicide application scheduling would be done through the range/range air space schedulers to coordinate dates/times for air and ground operations. Crews would maintain contact at all times with the ROCC when working in a restricted area. Sensitive areas would not receive herbicide (unless an aquatic label can be used). Sensitive areas include water bodies, areas adjacent to water bodies, sites without vegetation, and certain sensitive habitats as determined by the Eglin NRS. These locations would be digitized using GPS or GIS and the files provided to the applicator. Areas to be avoided due to concerns for threatened and endangered species would be identified through coordination with endangered species biologists.

2.2 MANAGEMENT REQUIREMENTS FOR HERBICIDE APPLICATIONS

Eglin AFB personnel would protect the environment during mixing, loading, application, and disposal of herbicides to minimize adverse impacts. Herbicides would not be applied if winds create drift outside the treatment area (generally greater than 10 miles per hour [mph]) or to water saturated soils (unless it is labeled for such use). A spill kit capable of containing and preventing release of these chemicals into adjacent water sources would be available during

mixing and loading operations. Water tanks/trucks would be required to obtain water for herbicide mixes, to eliminate the possibility of backflow contamination. Empty containers would be recycled or disposed of in accordance with Florida state pesticide and hazardous material laws. Pesticide application would be recorded on DD Form 1532-1 and a copy forwarded to 96 CES/CEOUE within one week of application. Records would include date of application, acres treated, target vegetation, application method, name of applicator, Florida state certification number, herbicide name (trade and active ingredient), USEPA registration number, concentration of final mixture (percentage), total volume applied, wind speed, and direction. Proper coordination with air traffic control and/or range management personnel would also be arranged to ensure safety. Contract applicators may need to obtain Department of Defense (DoD) clearance to land on and treat areas at the Eglin Range.

During the planning process, Eglin would consider the objectives of the proposed activity and impacts of actions that may disturb the soil surface or impact water quality. Planners would help identify sensitive areas and appropriate best management practices (BMPs) to be used during herbicide applications. The Eglin NRS would help identify terms and conditions of a written contract. Eglin would maintain written records of any natural resources management activity on the land. Plans would consider:

- Current and past land use, such as well sites, human occupation, and outdoor recreation.
- Sensitive areas such as perennial and intermittent streams, ephemeral streams or ponds, lakes, ponds, bays, wetlands, steep slopes, highly erosive or hydric soils, active gully systems, etc.
- Regulations and/or permitting requirements.
- Location, type, timing, and logistics of each activity.
- A maximum buffer of 300 feet from the bank, applied based on the most conservative buffer situation applicable (high percent slope, soil erodibility, surface water width/type). However, if percent slope, soil erodibility, and surface water width/type are determined for a specific location, a smaller buffer (minimum 35 feet from bank) may be utilized by referring to the Florida Division of Forestry's Silviculture BMP handbook **only if the buffer is not already predetermined by a sensitive species or habitat**.

BMPs for Chemical Applications

- Establish appropriate special management zone (SMZ) along perennial and intermittent streams and flowing bodies of water.
- Evaluate weather conditions (e.g., temperature, wind speed, and precipitation), equipment capabilities, and pesticide formulations to avoid pesticide drift into the SMZ.
- Conduct on-site pesticide handling away from streams, ponds, wells, and roadside ditches, such as tank mixing, loading, and rinsing equipment.
- Dispose of or recycle pesticide containers and/or excess pesticides according to local, state, and federal regulations and label requirements.
- Clean up and/or contain all pesticide spills immediately.

Practices to Avoid During Chemical Applications

- Applying a pesticide directly to water bodies (streams, lakes, and swamps) unless it is specifically prescribed and labeled for aquatic management.
- Broadcast applications of herbicides within SMZs (unless it is aquatic-labeled).

3. HERBICIDE CHEMICAL INFORMATION

3.1 DESCRIPTION OF HERBICIDES

In contrast to insecticides, herbicides are short-lived in the environment. Although the retention of residues varies depending on the specific chemical used, environmental condition, vegetation density, and soil properties, herbicides degrade within days or weeks, rather than the months or years common to many other classes of pesticides. The rate of degradation is defined as the half-life, which is the time it takes for the herbicide to degrade so that only 50 percent of the applied quantity is still present in the environment. More specifically, once applied, herbicide residues are subject to degradation through volatilization, adsorption, leaching, plant uptake, and numerous chemical and biological processes (Morrison and Meslow, 1983) (Table 3-1).

Table 3-1. Herbicide Half-Life

Herbicide	Example Trade Names	*Chemical Properties*	
		Mode of Action	Half-life
2,4-D amine	Aqua-Kleen	Hormone (auxin) mimic	10 days
Aminopyralid	Milestone	Hormone (auxin) mimic	30 days
Fluroxypyr	Vista	Hormone (auxin) mimic	36 days
Fosamine	Krenite	Bud inhibitor	7 days
Glyphosate	Accord XRT	Enzyme inhibitor	< 25 days
	Rodeo (aquatic)	Enzyme inhibitor	< 14 days
Imazapic	Plateau	Enzyme inhibitor	25–142 days
Imazapyr	Arsenal	Enzyme inhibitor	25–142 days
	Chopper	Enzyme inhibitor	25–142 days
	Habitat (aquatic)	Enzyme inhibitor	25–142 days
Metsulfuron methyl	Escort	ALS inhibitor	7–42 days
Sulfometuron methyl	Oust XP	Amino acid inhibitor	30 days
Triclopyr	Garlon 3a	Hormone (auxin) mimic	10–46 days
	Garlon 4 Ultra	Hormone (auxin) mimic	10–46 days
	Renovate 3 (aquatic)	Photosynthesis inhibitor	< 4 days

Table 3-2 illustrates the LD_{50} (median lethal dose) and LC_{50} (median lethal concentration) amounts of herbicide that would be required to kill half the members of a tested population. Acute toxicity is commonly measured by the lethal dose (LD) or lethal concentration (LC) that causes death in 50 percent of treated laboratory animals. LD_{50} indicates the dose of a chemical

per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). LC_{50} is the concentration of a chemical per volume of air or water and is expressed as milligrams per liter (mg/L). Chemicals are highly toxic when the LD_{50} or LC_{50} value is small and practically nontoxic when the value is large.

Table 3-2. Median Lethal Dose/Concentration (LD_{50}/LC_{50})

Trade Name	Chemical	Fish	Birds	Rats		
		LC_{50} = mg/L for 96 hours	LD_{50} = mg/kg	Oral LD_{50} = mg/kg	Inhalation LC_{50} = mg/L for 4 hours	Dermal LD_{50} = mg/kg
Aqua-Kleen	2,4-D	0.315	5,000	320–4,050	4.6	2,000[R]
Milestone	Aminopyralid	>100	>2,000	>5,000	>5.79	>5,000
Vista	Fluroxypyr	No data	>2,000	3,162	>6.2	>2,000[R]
Accord	Glyphosate	10–100	No data	>5,000*	>5.25*	>5,000*
Rodeo	Glyphosate	>100	>2,000	>5,000	>6.37	>5,000[R]
Garlon 3A	Triclopyr	10–100	No data	1,847	No data	>5,000[R]
Garlon 4	Triclopyr	0.1–1	No data	1,338	No data	>5,000
Garlon 4 Ultra	Triclopyr	0.1–1	501–2,000	No data	No data	No data
Renovate 3	Triclopyr	10–100	No data	1,847	No data	>5,000[R]
Krenite	Fosamine	330	>5,000	>5,000	>5.8	>5,000[R]
Escort	Metsulfuron methyl	150	>2,510	>5,000	>5.3	>2,000[R]
Oust	Sulfometuron methyl	148	>5,000	>5,000	>5.3	>5,000[R]
Plateau	Imazapic	>100	>5,000	>5,000	>2.38	>5,000[R]
Arsenal	Imazapyr	>100	>5,000	>5,000	>4.62	>2,000[R]
Chopper	Imazapyr	>100	>5,000	>5,000	>1.58	>5,000[R]
Habitat	Imazapyr	>100	>5,000	>5,000	>4.62	>2,000[R]

*LD_{50} and LC_{50} for this compound have not been determined. The LD_{50} and LC_{50} values given are for a similar material.
[R]Testing was performed on rabbits.
Information in this table was obtained from Dow AgroSciences, Cerexagri, Inc., DuPont, SePRO and BASF Material Safety Data Sheets.

The U.S. Environmental Protection Agency (USEPA) rates the toxicity of herbicides based on the toxicity criteria shown in Table 3-3. All of the herbicides proposed for use in the Proposed Action are classified as USEPA Category III, except for Vista/fluroxypyr (Category II), Chopper (Category II), Garlon 3A/triclopyr (Category I), and Renovate 3/triclopyr (Category I) (Tables 3-2, 3-3, and 3-4).

Acute toxicity tests measure the effects of high dose levels on populations over a short amount of time (i.e., days or hours). These levels are generally much greater than would be seen in the environment during and after the actual herbicide application. However, the LD_{50} and LC_{50} do not reflect potential health effects such as cancer, birth defects, or reproductive toxicity that may occur at levels of exposure below those that cause death. When continued exposure to low levels of a chemical over a long period causes health problems such as cancer, birth defects, reproductive problems, or gene mutation, it is considered to have "chronic effects."

Table 3-3. USEPA Toxicity Category Criteria for Pesticides

Toxicity Category*	Signal Word	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (mg/L)	Eye Irritation	Skin Irritation
I	DANGER Poison	0–50	0–200	0–0.2	Corrosive: corneal opacity not reversible within 7 days.	Corrosive
II	WARNING	>50–500	>200–2,000	>0.2–2.0	Corneal opacity reversible within 7 days; irritation persisting for 7 days.	Severe irritation at 72 hours
III	CAUTION	>500–5,000	>2,000–20,000	>2.0–20	No corneal opacity; irritation reversible within 7 days.	Moderate irritation at 72 hours
IV	NONE	>5,000	>20,000	>20	No irritation.	Mild irritation at 72 hours

Source: USEPA, 2006

*Toxicity decreases as the category number increases; USEPA Category I is most toxic while Category IV is least toxic.

Table 3-4. Proposed Herbicide Active Ingredient Toxicity Signal Word and Category

Herbicide	Acute Oral Toxicity	Acute Dermal Toxicity	Acute Inhalation	Primary Eye Irritation	Primary Skin Irritation	USEPA Toxicity Category
2,4-D amine	Caution	Caution	Caution	Danger-Poison	Caution	I
Aminopyralid	None	None	None	None	None	IV
Fluroxypyr	Caution	Caution	Caution	Warning	Caution	II
Fosamine	Caution	Warning	Caution	Warning	Caution	II
Glyphosate	None	None	Caution	Warning	None	II
Imazapic	None	Caution	None	None	Caution	III
Imazapyr	None	Caution	Caution	Caution	Caution	III
Metsulfuron methyl	None	Caution	Caution	Warning	Caution	II
Sulfometuron methyl	Caution	Caution	Caution	None	None	III
Triclopyr	Caution	Caution	Caution	Caution/Danger	Caution	I

Source: USEPA, 2006

*Toxicity decreases as the category number increases; USEPA Category I is most toxic while Category IV is least toxic.

During the acute toxicity studies, several dose levels are given and lethality and other effects are monitored. In contrast, several dose levels are given in chronic toxicity studies and the highest level(s) must cause clear adverse affects but not death. This testing is required in order to evaluate carcinogenicity. The USEPA determines chronic toxicity during the registering process required for all herbicides on the market. Table 3-5 lists chronic toxicity information for the proposed herbicide active ingredients.

Table 3-5. Chronic Toxicity Summary of the Proposed Herbicide Active Ingredients

Herbicide Active Ingredient	Potential Chronic Effects			
	Carcinogenic (Cancer)	Teratogenic (Birth Defects)	Reproductive	Mutagenic (Gene Mutation)
2, 4-D	USEPA reregistration concluded that 2, 4–D is a Group D chemical which is not classifiable, as to human carcinogenicity. (USEPA Reregistration 2005)	Malformations are likely to occur only at doses that are fetotoxic or maternally toxic. 2,4-D is not teratogenic. (SERA Page 3-13 and USEPA Reregistration 2005)	2,4-D may be subject to additional screening and/or testing to better characterize effects related to endocrine disruption. (USEPA Reregistration 2005)	Based on the overall pattern of responses observed in both in vitro and in vivo genotoxicity tests, 2,4-D is not mutagenic. (USEPA Reregistration 2005)
Aminopyralid	Aminopyralid is classified as "not likely to be carcinogenic to humans" based on the lack of evidence for carcinogenicity in mice and rats. (USEPA 8/10/2005)	There is no quantitative or qualitative evidence of increased susceptibility of developmental toxicity studies. (USEPA 8/10/2005)	There is no quantitative or qualitative evidence of increased susceptibility following pre-/ postnatal exposure. (USEPA 8/10/2005)	There is no quantitative or qualitative evidence of increased susceptibility following pre-/ postnatal exposure. (USEPA 8/10/2005)
Fluroxypyr	Fluroxypyr is classified as a "not likely" human carcinogen. (USEPA 9/30/98)	Fluroxypyr does not demonstrate developmental toxicity. (USEPA 9/30/98)	Fluroxypyr does not demonstrate reproductive toxicity. (USEPA 9/30/98)	The available studies indicate that fluroxypyr was not mutagenic in bacteria. (USEPA 9/30/98)
Fosamine	No chronic (long-term) studies are available for fosamine. Scientists have not tested fosamine ammonium for carcinogenicity. (WSDOT, 2006)	No chronic (long-term) studies are available for fosamine. (WSDOT, 2006)	Fosamine did not cause adverse reproductive effects when fed to rats at high doses. (WSDOT, 2006)	Fosamine ammonium displayed some mutagenic potential in one in vitro test for chromosome aberrations, while four other tests were negative for mutagenic potential. (USEPA Reregistration 1995)
Glyphosate	USEPA classified as evidence of noncarcinogenicity for humans. (SERA Page 3-16)	Pregnant rats (up to 3,500 mg/kg/day) and rabbits (up to 350 mg/kg/day) indicated no evidence of birth defects. (SERA Page 3-13)	Multigenerational studies of rats showed no adverse effects on fertility or reproduction with doses up to 30 mg/kg/day. (SERA Page 3-13)	No in vivo studies using mammalian species or mammalian cell lines have reported mutagenic activity. (SERA Page 3-17)
Imazapic	USEPA classified as not likely to be carcinogenic for humans. (SERA Page 3-5)	Two rat studies showed no signs of teratogenicity at the highest dose tested (i.e., 1,000 mg/kg/day). (SERA Page 3-4)	Multigenerational rat study showed no indication of any effect on reproductive performance. (SERA Page 3-5)	Four assays produced negative results for mutagenicity. (SERA Page 3-5)
Imazapyr	USEPA has categorized imazapyr as Class Evidence of non-carcinogenicity. (SERA Page 3-7)	Five studies show imazapyr does not cause adverse developmental effects. (SERA Page 3-6)	Five studies reveal that imazapyr does not cause adverse reproductive effects. (SERA Page 3-6)	Three studies have shown negative potential for potential mutagenic activity. (SERA Page 3-7)

Table 3-5. Chronic Toxicity Summary of the Proposed Herbicide Active Ingredients (cont'd)

Metsulfuron methyl	USEPA concluded that: "Metsulfuron methyl was not oncogenic in the chronic rat and mouse bioassays. (SERA Page 3-7)	USEPA –"The results of a series of studies indicated that there were no teratogenic hazards associated with the use of metsulfuron methyl. (SERA Page 3-6)	USEPA-"The results of a series of studies indicated that there were no reproductive, hazards associated with the use of metsulfuron methyl. (SERA Page 3-6)	USEPA concluded that "Metsulfuron methyl was not mutagenic in the chronic rat and mouse bioassays. (SERA Page 3-7)
Sulfometuron methyl	Four studies find that exposure to sulfometuron poses no carcinogenic risk to humans. (SERA Page 3-8)	The no observable adverse effect level for teratogenic effects is 300 mg/kg/day. (SERA Page 3-7)	No adverse effects on reproductive parameters were observed in rats exposed to dietary sulfometuron methyl at dietary concentrations up to 5,000 ppm. (SERA Page 3-8)	Four studies show no mutagenic activity. (SERA Page 3-8)
Triclopyr	USEPA classified as Group D chemical (not classifiable as to human carcinogenicity) because of marginal response in mice/rats, and the absence of additional support from structural analogs or genotoxicity. (SERA Page 3-9 & USEPA Reregistration 1998)	Studies show that teratogenic effects occur only at doses that are maternally toxic. At doses which do not cause maternal toxicity, there is not apparent concern for teratogenic effects. (SERA Page 3-8)	Studies show that reproductive effects occur only at doses that are maternally toxic. At doses which do not cause maternal toxicity, there is not apparent concern for teratogenic effects. (SERA Page 3-8)	Negative in several tests, but weakly positive in a test in rats. (SERA Page 3-10)

Source: USDAFS, 2006

3.2 ADJUVANTS/SURFACTANTS

Adjuvants are compounds added to herbicides solutions to improve the performance of an herbicide and/or the ease and accuracy of herbicide application (i.e., decrease drift). The most effective adjuvants vary from herbicide to herbicide and can be a surfactant, fertilizer, or oil. Surfactant and oil adjuvants promote herbicide adherence and decrease spray solution surface tension. This causes the herbicide to "stick" and "spread out" across vegetation surfaces, instead of beading up like a water droplet. Lowering the surface tension and increasing the adherence of the spray makes the herbicide solution more effective, especially to waxy leaf species. Fertilizer adjuvants increase the herbicide activity on some weed species (USDAFS, 2006).

Surfactants are also commonly used in herbicide formulations. Surfactants are added to herbicides to improve herbicide mixing and the absorption or permeation of the herbicide into the plant. Like dyes and other inert ingredients, there is often limited information on the types of surfactants used and the toxicity of surfactants, especially since the industry considers the surfactant to play a key role in the effectiveness of the herbicide formulations. Most knowledge of surfactants is kept as proprietary information and not disclosed. The toxicological studies performed on herbicide formulations (which contain the inert ingredients and surfactants) may accurately portray the toxicity and risks posed by the surfactant (USADFS, 2006).

There is no one adjuvant/surfactant that works well for all herbicides. Herbicide manufactures usually recommend certain adjuvants/surfactants for that formulation and different application methods. These recommendations can be found on the herbicide label.

3.3 ADDITIVE AND SYNERGISTIC EFFECTS

Additive effects occur when mixing two pesticides provide the same response as the combined effects of each material when applied alone. The products neither hurt nor enhance each other. Such mixes save time, labor, and equipment use. Synergistic responses are often confused with additive effects and occur when two pesticides provide a greater response than the added effects of each material when applied separately. Unlike additive effects, the chemicals in a synergistic combination are not neutral toward each other. Rather, they interact in some way that increases their effect and may increase control (Petroff, 2007). Chemical herbicide applicators would avoid mixing chemicals where possible to negate additive and synergistic effects.

4. BIOLOGICAL INFORMATION

The species considered then excluded from further assessment include Florida perforate lichen, sea turtles, marine mammals, and piping plover. Florida perforate lichen, sea turtles, and piping plover occur on Santa Rosa Island (SRI). No herbicide treatment would occur on SRI and no direct or indirect exposure routes were identified. No potential impacts to marine mammals have been identified given the project location. Therefore Eglin NRS has made a **No Effect** determination for potential impacts to Florida perforate lichen, sea turtles, marine mammals, and piping plover for the Proposed Action.

The following federally listed endangered (E) and threatened (T) species that are known or have potential to occur within the project area are considered for this action:

Common Name	Scientific Name	Federal Status
Bald eagle	*Haliaeetus leucocephalus*	T
Eastern indigo snake	*Drymarchon corais couperi*	T
Flatwoods salamander	*Ambystoma cingulatum*	T
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T
Okaloosa darter	*Etheostoma okaloosae*	E
Red-cockaded woodpecker	*Picoides borealis*	E

These state-listed species are considered:

Common Name	Scientific Name
Burrowing owl	*Athene cunicularia*
Dusky gopher frog	*Rana capito sevosa*
Florida black bear	*Ursus americanus floridanus*
Florida bog frog	*Rana okaloosae*
Gopher tortoise	*Gopherus polyphemus*

In addition these sensitive plant habitats are considered: High Quality Natural Communities (HQNCs), Outstanding Natural Areas (ONAs), and Significant Botanical Sites (SBSs).

4.1 BALD EAGLE

The bald eagle (*Haliaeetus leucocephalus*) is listed as a federally threatened species. Eagles are territorial and exhibit a strong affinity for a nest site once a nest has been established. It is common for a breeding pair to rebuild damaged or lost nests in the same tree or in an adjacent tree. Individual pairs return to the same territory year after year, and territories are often inherited by subsequent generations. The nesting period in the southeast United States extends from 01 October to 15 May, with most nests finished by the end of November (U.S. Air Force, 2006). Bald eagles nest at one location on the Eglin Mainland Reservation: Eglin Main Base between Cobbs Overrun and Test Area A-22. The pair of eagles at this site has fledged one to two birds per year in most years, but in some years no young were fledged (U.S. Air Force, 2006).

Eglin AFB follows the U.S. Fish and Wildlife Service (USFWS) Habitat Management Guidelines for the bald eagle in the southeast region, which limits certain types of development within 1,500 feet around the nest but allows some activities outside of the reproduction season (01 October to 15 May) such as logging, land clearing, and construction.

4.2 EASTERN INDIGO SNAKE

The eastern indigo snake (*Drymarchon corais couperi*) is listed as a federal and state threatened species and is the largest nonvenomous snake in North America. The primary reason for its listing is population decline resulting from habitat loss and fragmentation. Movement along travel corridors between seasonal habitats exposes the snake to danger from increased contact with humans. Indigo snakes frequently utilize gopher tortoise burrows and the burrows of others species for overwintering. The snake frequents flatwoods, hammocks, stream bottoms, riparian thickets, and high ground with well-drained, sandy soils. The indigo snake could occur anywhere on the Eglin Range because it uses such a wide variety of habitats (U.S. Air Force, 2006).

The species is extremely uncommon on the Eglin Range with the sighting of only 29 indigo snakes throughout the Eglin Range from 1956 to 1999, while no sightings have been reported since 1999 (Gault, 2006). Most of these snakes were seen crossing roads or after being killed by vehicles. It is difficult to determine a precise number or even estimate of the number of these snakes due to the secretive nature of this species (U.S. Air Force, 2006).

4.3 FLATWOODS SALAMANDER

The flatwoods salamander (*Ambystoma cingulatum*) is federally listed as threatened and is a state species of special concern. This small salamander is about 5 inches long with a dark gray back and white streaks on the head, back, limbs, and tail. The belly may be completely black or dark gray or may be covered with white flecks. Optimum habitat for this small mole salamander is open, mesic (moderately wet) woodlands of longleaf or slash pine flatwoods maintained by frequent fires and that contain shallow, ephemeral wetland ponds. Males and females migrate to these ephemeral ponds during the cool, rainy months of October to December. The females lay their eggs in vegetation at the edges of the ponds. Flatwoods salamanders may disperse long distances from breeding sites to upland sites where they live as adults (U.S. Air Force, 2006).

There are 18 known breeding ponds for the flatwoods salamander on the Eglin Range. Additionally, the Eglin Range supports approximately 17,000 acres of potential salamander habitat in mesic flatwoods.

The primary threat to the flatwoods salamander is loss of mesic (moderately wet) habitat through the filling in of wetlands and other alterations to the landscape hydrology. Flatwoods salamander habitat is also threatened by the introduction of invasive, nonnative species. Flatwoods salamanders appear to have declined in numbers of individuals and active breeding wetlands since the original surveys in 1993 and 1994. This is possibly due in part to several years of drought in the late 1990s and early 2000s. Breeding wetlands may not have remained

wet long enough for larvae to complete metamorphosis if rainfall amounts were not sufficient, resulting in little population recruitment over the last few years at these wetlands (U.S. Air Force, 2006).

The USFWS has established a 450-meter (1,476-foot) buffer area from the wetland edge of the confirmed breeding ponds. The USFWS guidelines in the *Federal Register*, dated 01 April 1999, applies restrictions for any ground-disturbing activities within this buffer area to minimize the potential for direct impacts to salamanders, the introduction and spread of invasive nonnative plant species, and alterations to hydrology and water quality.

4.4 GULF STURGEON

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a federally listed threatened species and a state-listed species of special concern. This large fish occurs predominately in the northeastern Gulf of Mexico, feeding in offshore areas and inland bays during the winter months and moving into freshwater rivers during the spring to spawn. Migration into fresh water generally occurs from March to May, while migration into salt water occurs from October through November (U.S. Air Force, 2006).

4.4.1 Gulf Sturgeon Critical Habitat

Gulf sturgeon critical habitat was designated in 2003. Federally designated critical habitat is defined as specific areas that contain physical or biological features essential to the species' conservation and that may require special management considerations or protection. As it pertains to the Eglin Range, Choctawhatchee Bay (including main body of Choctawhatchee Bay, Hogtown Bayou, Jolly Bay, Bunker Cove, and Grassy Cove, and excluding all other bayous, creeks, and rivers at their mouths/entrances), Santa Rosa Sound, Yellow River, Shoal River, Blackwater Bay, East Bay, and the Gulf of Mexico out to 1 nautical mile offshore of Santa Rosa Island have been designated as critical habitat. The lower rivers provide summer resting and migration habitat, and the bays, sound, and Gulf contain winter feeding and migration habitat (U.S. Air Force, 2006).

The major mission-related issues for Gulf sturgeon in freshwater and estuarine areas are erosion from test areas and range roads and potential impacts to river and bay bottoms and banks from boats and amphibious vehicles (U.S. Air Force, 2006). The USFWS guidance for habitat preservation is to utilize established landings on the Yellow River for watercraft and avoid scarring of river bottoms and damage to seagrass beds (U.S. Air Force, no date).

Critical habitat for the Gulf sturgeon was based on the primary constituent elements essential for its conservation, as defined in the 2003 *Federal Register*. These seven primary constituent elements are:

(1) Abundant food items, such as detritus, aquatic insects, worms, and/or mollusks, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods, mollusks and/or

crustaceans, within estuarine and marine habitats and substrates for subadult and adult life stages.

(2) Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay.

(3) Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions.

(4) A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of freshwater discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larval staging;

(5) Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics necessary for normal behavior, growth, and viability of all life stages.

(6) Sediment quality, including texture and chemical characteristics, necessary for normal behavior, growth, and viability of all life stages.

(7) Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., an unobstructed river or a dammed river that still allows for passage).

Gulf sturgeon critical habitat is composed of 14 geographic areas, or units. The units collectively encompass almost 2,800 river kilometers and over 6,000 square kilometers of estuarine and marine habitat.

4.5 OKALOOSA DARTER

The Okaloosa darter (*Etheostoma okaloosae*) is considered a federally and state-listed endangered species. Spawning occurs from March to October, with the greatest amount of activity taking place during April (USFWS, 1998). The entire global population of this species is found in the tributaries and main channels of Toms, Turkey, Mill, Swift, East Turkey, and Rocky Creeks, which drain into two bayous of Choctawhatchee Bay. These seepage streams have persistent discharge of clear, sand-filtered water through sandy channels, woody debris, and vegetation beds. The Eglin Range contains 90 percent of the 457-square-kilometer (176-square-mile) drainage area. The remaining portions of the watershed are within the urban areas of Niceville and Valparaiso (U.S. Air Force, 2006).

The most immediate threat to the Okaloosa darter is loss of habitat through degradation of stream water quality from soil erosion into streams. The areas of high soil and sediment erosion probability are from borrow pits, clay roads that cross streams, and on a few test area sites from vegetation maintenance methods on slopes using choppers. A 1992 study identified erosion from

borrow pits and roads as a major contributor to the degradation of darter habitat. Mission activities could avoid further degradation of stream quality by keeping vehicle activity and troop movement confined to rails, bridges, and roads and conducting ground disturbing activities only outside of a 300-foot buffer around Okaloosa darter streams. These procedures are available to minimize sediment erosion into the darter watersheds and to avoid a consultation process under Endangered Species Act regulations (U.S. Air Force, 2006).

Due to a recovery plan that Eglin AFB implemented for the Okaloosa darter in 1998, the darter is currently under federal status review for potential downlisting from endangered to threatened in 2007. To ensure downlisting of the Okaloosa darter, Eglin AFB is:

- Protecting instream flows and historical habitat through management plans, conservation agreements, easements, and/or acquisitions.
- Implementing an effective habitat restoration program to control erosion from roads, clay pits, and open ranges.
- Demonstrating that the Okaloosa darter population is stable or increasing and that the range of the Okaloosa darter has not decreased at all historical monitoring sites.
- Seeing that no foreseeable threats exist that would impact the survival of the species.

Eglin NRS is about 95 percent complete with erosion control projects in darter watersheds and will soon be entering the maintenance phase (U.S. Air Force, 2006).

4.6 RED-COCKADED WOODPECKER

The RCW (*Picoides borealis*) is listed as a federally endangered bird species and a state species of special concern. The RCW excavates cavities in live longleaf pine trees that are at least 85 years old. The RCW historically had a habitat range as far north as New Jersey and as far west as Oklahoma. Today, the RCW has been restricted to the southeastern United States, from Florida to Virginia and to southeast Texas, due to a loss of habitat. In the southeast, 98 percent of the longleaf pine forests have been removed, making federal lands such as Eglin AFB primary habitat for the species. Due to the preservation and continuity of longleaf pine forests on Eglin, the Eglin Range has one of the largest remaining populations of RCWs in the country. In 2003, the USFWS identified Eglin AFB as 1 of 13 primary core populations for the RCW (U.S. Air Force, 2006).

The removal of longleaf pine trees, degradation of quality habitat, or noise generated from mission-related or other activities are potential threats to the RCW on the Eglin Range. Eglin is executing an approved USFWS management strategy to meet certain growth objectives of the RCW and to obtain increased mission flexibility with the federal requirements for RCW impacts (U.S. Air Force, 2006).

The locations of active RCW cavities, which are defined as any tree containing one or more cavities that are utilized by the RCW, are recorded in the Eglin Natural Resources GIS. Additionally, inactive RCW cavities, which are defined as those cavities that were once utilized

by the RCW but have not shown recent activity, are spatially recorded. The NRS has also mapped the RCW foraging habitat around active clusters of RCW cavities in the GIS. Consultation guidelines require that transient foot and vehicle traffic occurring for longer than two hours at a time be avoided within 200 feet of active RCW trees. No traffic can leave established trails and roads. Digging, excavating, or bivouacking is prohibited within the 200-foot buffer area. In addition, if timber is to be removed within 0.5 miles of active cavity trees, then a forage habitat analysis must be completed to determine potential impacts. Consultation would be required if resulting resources fall below USFWS guidelines.

4.7 OTHER SPECIES CONSIDERED

4.7.1 Burrowing Owl

The burrowing owl (*Athene cunicularia floridana*) is a state species of special concern. The owl creates burrows, similar to gopher tortoise burrows, to hide from predators. They are typically found in open habitats with short grasses and few trees. These small owls have been seen on many test areas across the Eglin Range, but the only confirmed population is on Test Area B-70 (U.S. Air Force, 2006).

4.7.2 Dusky Gopher Frog

Dusky gopher frogs (*Rana capito sevosa*), a state species of concern, are associated with gopher tortoise habitat, as they use gopher tortoise burrows for cover, but are also known to flourish where the tortoises no longer occur. They will also use oldfield mouse burrows, hollow stumps, and other holes for cover. The species requires nearby seasonally flooded grassy ponds, depression marshes, and some sandhills upland lakes that lack fish populations, found within the Sandhills ecological association, for breeding. They have been found in the longleaf pine, turkey oak, pine flatwood, sand pine scrub, and xeric hammock open or forested communities of the Sandhills and Open Grassland/Shrubland ecological associations up to 2 kilometers from the breeding ponds. Eglin supports the largest known concentration of reproductive sites of the dusky gopher frog subspecies anywhere within its range (FNAI, 1993).

4.7.3 Florida Black Bear

The Florida black bear (*Ursus americanus floridanus*) is currently listed as a state threatened species except in Baker and Columbia Counties and Apalachicola National Forest. Florida black bear populations are currently found in Florida and Georgia, as well as a small population in Alabama. Eglin AFB is considered to be the smallest population, with an estimated 60 to 100 individuals; however, Eglin's black bear population has shown signs of increase since the early 1990s. Reasons for population declines include loss of habitat due to urban development and direct mortality due to collisions with vehicles. Black bear in Florida breed in June–July, and young are born in January–February. Most black bears within the Eglin Range utilize the large swamps and floodplain forests in the southwest and northern portions of the Eglin Range, where they feed on fruits, acorns, beetles, and yellow jackets. Black bear sightings have occurred at numerous locations throughout the Eglin Range, the majority of which have been within the interstitial areas (U.S. Air Force, 2006).

4.7.4 Florida Bog Frog

The Florida bog frog (*Rana okaloosae*), a species of special concern by the state, can only be found within Walton, Okaloosa, and Santa Rosa Counties. Most of the habitat for the frog lies on Eglin AFB property with all known locations of the frog in small tributary streams of the Yellow, Shoal, and East Bay Rivers. There are 65 documented bog frog locations on the Eglin Range, but only 58 of those have been verified.

4.7.5 Gopher Tortoise

The gopher tortoise (*Gopherus polyphemus*) is a state species of special concern but will be uplisted to threatened in the spring of 2007. The tortoise is found primarily within the Sandhills and Open Grassland ecological associations on the Eglin Range. Gopher tortoise burrows serve as important habitat for many species, including the federally listed eastern indigo snake (U.S. Air Force, 2006).

4.8 SENSITIVE PLANT HABITATS

Sensitive plant habitats on Eglin include High Quality Natural Communities (HQNCs), Outstanding Natural Areas (ONAs), and Significant Botanical Sites (SBSs).

4.8.1 High Quality Natural Communities

The Florida Natural Areas Inventory (FNAI) identified certain areas of Eglin that are unique due to their high quality examples of natural communities or presence of rare species. Termed "High Quality Natural Communities," these areas are distinguished by the uniqueness of the community, ecological condition, species diversity, and presence of rare species. These high quality areas total 75,266 acres and cover approximately 16 percent of the installation (U.S. Air Force, 2006a).

4.8.2 Outstanding Natural Areas

From the HQNCs, FNAI identified 17 larger-scale landscapes containing complexes of these high quality areas and locations of rare species, which were named Outstanding Natural Areas as listed below (U.S. Air Force, 2006a).

(1) A-77 Outstanding Natural Area

(2) Alaqua-Blount Creek Confluence

(3) Alice Creek

(4) Boiling Creek/Little Boiling Creek

(5) Brier Creek

(6) East Bay Flatwoods and Scrub Mosaic

(7) Live Oak Creek

(8) Lower Weaver River

(9) Patterson Outstanding Natural Area and Extension

(10) Piney Creek

(11) Prairie Creek

(12) Santa Rosa Island

(13) Scrub Pond

(14) Spencer Flats Wetlands

(15) White Point

(16) Whitmier Island

(17) Yellow River Basin

4.8.3 Significant Botanical Sites

FNAI also identified 15 Significant Botanical Sites that support rare plants on Eglin as listed below. Large portions of the Outstanding Natural Areas and the Significant Botanical Sites overlap with one another. Combined, both of these identified areas total 43,210 acres, or approximately 9 percent of the installation (U.S. Air Force, 2006a).

(1) East Bay Savannahs

(2) Patterson Natural Area Expansion

(3) Santa Rosa Island

(4) Blue Spring Creek Lakes

(5) Malone Creek

(6) Titi Creek Wilderness Area

(7) Live Oak Creek

(8) Turkey Gobbler Creek Cypress Swamp

(9) Turkey Hen Creek Swamp

(10) Boiling Creek and Little Boiling Creek

(11) Hick's Creek Prairie

(12) Whitmier Island

(13) Brier Creek

(14) Hickory Branch Hardwood Forest

(15) Piney Creek

5. DETERMINATION OF IMPACTS

5.1 POTENTIAL IMPACTS TO SPECIES

Mayer and Ellersieck (1986) reviewed 4,901 acute toxicity tests of over 400 herbicides stored in the database of the U.S. Fish and Wildlife Service to determine if there were any statistically valid trends that could be used to compare the 66 species studied. They found that there is no single species, family, or class that, in all cases, is most sensitive to chemicals. They agreed with the conclusions of others, that species best represent themselves and not others, but they also observed it was somewhat common that insects were more sensitive to most herbicides than crustaceans, followed by fish, then amphibians.

The factors contributing to the potential adverse impacts to threatened and endangered species from herbicide application under the Proposed Action, as discussed in Chapter 3, are as follows:

- Herbicide application formulation, rates, and methods, which are the primary determinant of possible chemical impacts
- Possible impacts from exposure to surface runoff and subsurface flows, as well as the potential to contaminate groundwater.
- Possible habitat alterations that may include physical and chemical changes to the biological structure and function of ecosystems that adversely alter the quality and/or quantity of the species habitat.
- Life cycle interference with potential impacts that could reduce the breeding success or viability of the animal population.
- Species toxicity with potential impacts to the degree to which a chemical can harm an organism including biochemical and enzyme function interference and/or organ damage.
- The short- and long-term interaction of the chemicals with soil constituents, which directly influences the propensity of the chemicals to adversely impact the species and/or its habitat.

5.2 HERBICIDE TOXICITY TO MAMMALS AND BIRDS

Terrestrial animals may be exposed to herbicides in several ways, including direct spray, ingestion of plants or other items that have been sprayed, grooming, and indirect contact with vegetation that has been sprayed or inhalation of spray. Wildlife may come in contact with contaminated vegetation or ingest contaminated vegetation or prey. Table 5-1 summarizes the risks posed to mammals and birds from herbicide usage.

Table 5-1. Mammalian and Avian Toxicity Risk Assessment

Chemical Name	Mammalian Toxicity (LD_{50} in mg/kg body weight)	Avian Toxicity (LD_{50} in mg/kg body weight)	Risk Assessment
2,4-D (amine form)	Moderate (639 – >5,000) Low /moderate (100–1,800)	Low/moderate (472 – >2,000) Low/moderate (300–5,000)	Good data for mammals and birds; birds somewhat less sensitive than mammals; exposure not expected to cause observable adverse signs of toxicity but may lead to eye or skin irritation; exposure at higher than expected levels also affects kidneys, nervous system, and thyroid and may lead to vomiting, diarrhea, and muscle twitches.
Aminopyralid	Very slightly toxic (>5,000)	Low/moderate (>2,250–>5,556)	There are no acute or chronic risks to nontarget endangered or nonendangered birds, wild mammals, and terrestrial invertebrates.
Fluroxypyr	Low (>2,000)	Low/moderate (>3,162)	Fluroxypyr is practically nontoxic to birds and only slightly toxic to small mammals. No chronic effects observed (EPA 1998).
Fosamine	Very slightly toxic (>5,000)	Very slightly toxic (>5,000)	Fosamine ammonium is only "very slightly toxic" to birds and mammals. No chronic toxic effects in adults or birth defects in offspring were reported (Chrzanowski et al. 1979). The dermal toxicity of fosamine, however, falls under the USEPA Category II, indicating the second most severe level of acute toxicity for studies using laboratory animals. Fosamine is also an eye irritant.
Glyphosate	Nearly nontoxic (none given) Low (1,500 – >5,000)	Nearly nontoxic (3,850) Low (1,500 – >5,000)	Good data on mammalian and avian wildlife; toxic effects very unlikely even at highest allowable application rates.
Imazapic	Low (none given)	Low (none given)	Most data are from experimental mammals, there is some uncertainty about extrapolating conclusions to wildlife; larger mammals affected more than smaller, however adverse effects on mammals or birds are unlikely under typical or worst-case cases of exposure.
Imazapyr	Nearly nontoxic (4,800–5,000) Low (none given)	Nearly nontoxic (<2,150) Low (none given)	Most data are from experimental animals, there is some uncertainty about extrapolating conclusions to wildlife; little data on toxic levels; sufficient data are available to conclude that adverse effects on terrestrial species are unlikely under typical or worst-case cases of exposure.
Metsulfuron methyl	Nearly nontoxic (none given) Low (>2,000)	Nearly nontoxic (<2,150) Low (>2,000)	Most data are from experimental mammals, there is some uncertainty about extrapolating conclusions to wildlife; sufficient data are available to conclude that adverse effects on terrestrial species are unlikely under typical or worst-case cases of exposure; may cause weight loss at sublethal doses.
Sulfometuron methyl	Low (<5,000 ppm) Low (none given)	Low (<5,620 ppm) Low (none given)	Very limited data on birds; observable effects on most mammals and birds not expected; possible reproductive effects on some species although evidence is not conclusive.
Triclopyr	Slightly toxic (310–713) Low (none given)	Very low (1,698) Low (none given)	Good data for birds and mammals; application rates at or above those normally used not expected to affect terrestrial animals.

Source: USDAFS, 2006

Pesticides have been identified as a major cause of mortality for numerous species. Organophosphorus and carbamate insecticides are currently the chemicals most commonly associated with mass mortality of wildlife, especially migratory birds (Vyas, 1999). The effects of many herbicides on mammalian and avian wildlife have not been studied in detail, although most herbicides have been tested on laboratory animals (especially rats, mallard ducks, bobwhite quails, mice, rabbits, and dogs). Findings are then extrapolated to wildlife, which means that conclusions regarding the effects of these chemicals on wildlife are somewhat uncertain. However, risk levels for herbicide use are calculated in a very conservative manner, and worst-case exposure scenarios have been studied for most herbicides (USDAFS, 2006).

Most mammals and birds would usually not be affected by herbicide applications when suggested application rates are observed (Figure 5-1). The herbicides are specifically designed to kill plants by contact with foliage and/or through root uptake from the soil. Suggested application dosages of herbicides are usually much lower than is necessary to cause acute reactions in animals. In addition, chronic doses are difficult to realize because of the low persistence of herbicides. Most animals are physically unable to consume enough food in a short enough period of time to accumulate significant residues of herbicides at field application rates. In addition, herbicide residues consumed orally are excreted rapidly by the body, a physiological process that is in marked contrast to the well-known bioaccumulation of many contaminants. Bioaccumulation is most likely to occur when organisms are exposed to persistent chemicals of low water solubility and high lipid solubility; herbicides do not generally meet these requirements and thus contrast strongly with many other pesticides (Morrison and Meslow, 1983).

5.2.1 Acute and Chronic Toxicity

The high tolerance of animals to herbicide residues and the lack of significant accumulation of residues in animals or their environment indicates that health and reproductive success should not be directly affected by herbicide application—numerous studies have shown this to be the case in both field and laboratory experiments (Morrison and Meslow, 1983). As mentioned earlier, acute toxicity is commonly measured by the lethal dose (LD) that causes death in 50 percent of treated laboratory animals. LD_{50} indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). Chemicals are highly toxic when the LD_{50} value is small and practically nontoxic when the value is large. Acute toxicity tests measure the effects of high dose levels on populations over a short amount of time (i.e., days or hours). These levels are generally much greater than would be seen in the environment during and after the actual herbicide application. In contrast, several dose levels are given in chronic toxicity studies and the highest level(s) must cause clear adverse affects but not death. The lowest reported dose that causes the most sensitive effect from chronic or acute exposure to the active ingredient, in the most sensitive species, is used to analyze and indicate the potential for an adverse effect when that dose is exceeded. These doses are referred to as "toxicity indices," and no observable adverse effect levels (NOAELs) are used whenever possible. If available data have not identified a NOAEL, then an LD_{50} or other level may be used. Tables 5-2 and 5-3 list the levels for acute and chronic effects from the active ingredient in herbicides proposed for use. The tables give toxicity indices for mammals and birds used in the effects analysis, the indices represent the most sensitive endpoint from the most sensitive species for which adequate data were available.

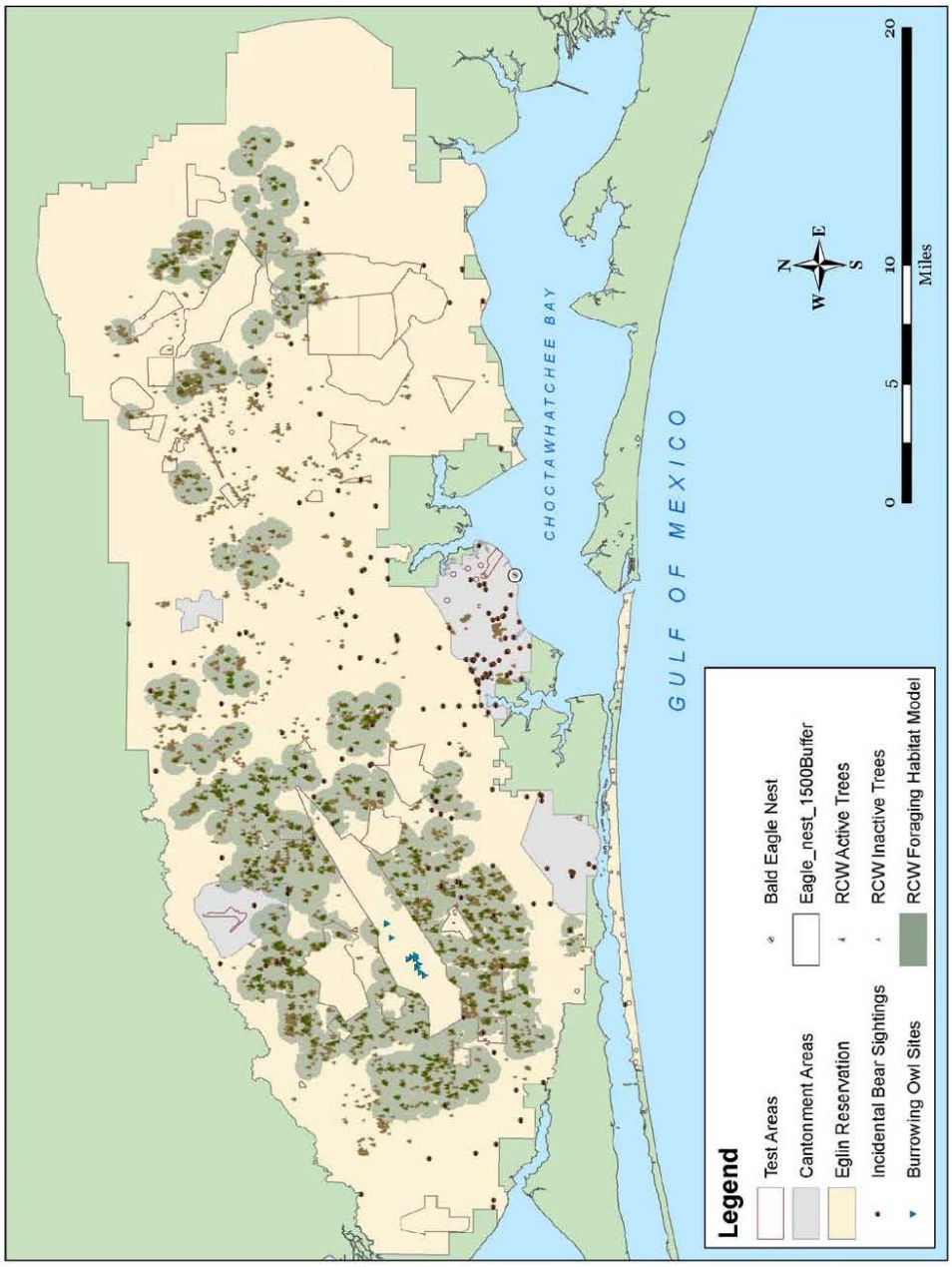

Figure 5-1. Mammals and Birds on Eglin AFB

Table 5-2. Acute and Chronic Toxicity Indices* for Mammals

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
2, 4-D	Acute	"Nonlethal"	10 mg/kg	Rat	Effects on kidney, blood, and liver
	Chronic	NOAEL	1 mg/kg/day	Rat/dog	Effects on kidney, blood, and liver at 5 mg/kg/day
Aminopyralid	Acute	NOAEL	232 mg/kg	Dog	Slight diffuse hyperplasia, hypertrophy of the mucosal epithelium of the stomach at 929 mg/kg/day
	Chronic	NOAEL	50 mg/kg/day	Rat	Cecal enlargement, slight mucosal hyperplasia, slightly decreased body weights at 500 mg/kg/day
Fluroxypyr	Acute	NOAEL	100 mg/kg	Rat	500 mg/kg based on kidney effects and increased deaths
	Chronic	NOAEL	150 mg/kg/day	Dog	LOAEL not established
Fosamine	Acute	LD_{50}	24,400 mg/kg	Rat	50% mortality at 24,400 mg/kg
	Chronic	NOAEL	NA	NA	No chronic (long-term) studies available
Glyphosate	Acute	NOAEL	175 mg/kg	Rabbit	Diarrhea at 350 mg/kg
	Chronic	NOAEL	175 mg/kg/day	Rabbit	Diarrhea at 350 mg/kg
Imazapic	Acute	NOAEL	350 mg/kg	Rabbit	Decreased body weight at 500 mg/kg
	Chronic	NOAEL	45 mg/kg/day	Dog	Microscopic muscle effects at 500 mg/kg
Imazapyr	Acute	NOAEL	250 mg/kg	Dog	No effects at highest doses tested
	Chronic	NOAEL	250 mg/kg/day	Dog	No effects at highest doses tested
Metsulfuron methyl	Acute	NOAEL	25 mg/kg	Rat	Decreased weight gain at 500 mg/kg
	Chronic	NOAEL	25 mg/kg/day	Rat	Decreased weight gain at 125 mg/kg
Sulfometuron methyl	Acute	NOAEL	87 mg/kg	Rat	Decreased body weight at 433 mg/kg
	Chronic	NOAEL	2 mg/kg/day	Rat	Effects on blood and bile ducts at 20 mg/kg/day
Triclopyr	Acute	NOAEL	100 mg/kg	Rat	Malformed fetuses at 300 mg/kg
	Chronic	NOAEL	0.5 mg/kg/day	Dog	Effect on kidney at 2.5 mg/kg/day

Source: Bautista, 2005

LOAEL = Lowest Observeable Adverse Effect Level; lowest exposure associated with an adverse effect.
NOAEL = No Observable Adverse Effect Level

Exposure to extremely high levels of most herbicides through direct ingestion or spraying during laboratory studies often lead to death or a variety of sublethal toxic effects including damage/irritation to the nervous system, kidneys, eyes, skin; inhibition of reproduction; and other problems. (These are in reference to acute exposure effects.) However, the doses required to produce such effects were much higher than those wildlife would encounter from application of herbicides in the field even under worst-case scenarios (USDAFS, 2006). Application levels for herbicides applied would be well below the level associated with causing acute effects.

Table 5-3. Acute and Chronic Toxicity Indices* for Birds

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
2,4-D	Acute	LD_{50}	562 mg/kg/day	Mallard and quail	50% mortality at 562 mg/kg
	Chronic	NOAEL	1 mg/kg/day	Rat/dog	Effects on kidney, blood, and liver at 5 mg/kg/day
Aminopyralid	Acute	LD_{50}	>2,250 mg/kg	Quail	50% mortality at greater than 2,250 mg/kg/day
	Chronic	NOAEL	50 mg/kg/day	Rat	Cecal enlargement, slight mucosal hyperplasia, slightly decreased body weights at 500 mg/kg/day
Fluroxypyr	Acute	LD_{50}	>2,000 mg/kg/day	Mallard and quail	50% mortality at greater than 2,000 mg/kg/day
	Chronic	NOAEL	150 mg/kg/day	Dog	LOAEL not established
Fosamine	Acute	LD_{50}	10,000 mg/kg	Mallard and quail	50% mortality at 10,000 mg/kg
	Chronic	NOAEL	NA	NA	No chronic (long-term) studies available
Glyphosate	Acute	NOAEL	562 mg/kg	Mallard and quail	No effects at highest dose
	Chronic	NOAEL	100 mg/kg/day	Mallard and quail	No effects on reproduction at highest dose
Imazapic	Acute	NOAEL	1,100 mg/kg	Quail	No effects at highest dose
	Chronic	NOAEL	113 mg/kg	Quail	Decreased weight gain in chicks at 170 mg/kg
Imazapyr	Acute	NOAEL	674 mg/kg	Quail	No effects at highest dose
	Chronic	NOAEL	200 mg/kg/day	Mallard and quail	No effects at highest dose
Metsulfuron methyl	Acute	NOAEL	1,043 mg/kg	Quail	No significant effects at highest dose
	Chronic	NOAEL	120 mg/kg/day	Mallard and quail	No significant effects at highest dose
Sulfometuron methyl	Acute	NOAEL	312 mg/kg	Mallard	Decreased weight gain at 625 mg/kg
	Chronic	NOAEL	2 mg/kg/day	Rat	Effects on blood and bile ducts at 20 mg/kg/day
Triclopyr	Acute	LD_{50}	535 mg/kg/day	Quail	50% mortality at 535 mg/kg
	Chronic	NOAEL	10 mg/kg/day	Mallard & quail	Decreased survival of offspring, reduced eggshell thickness at 20 mg/kg/day

Source: Bautista, 2005

*Indices represent the most sensitive endpoint from the most sensitive species for which adequate data are available

Herbicide treatments would continue as needed to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance. Chronic exposure levels from herbicides would be below the level associated with chronic effects due to the short half-life of the chemicals and the reduction of use after initial application. Table 5-4 lists the most extreme case of herbicide that would be present

after one year using the maximum amount of herbicide at the maximum application rate (one treatment per acre) using the maximum half-life.

Table 5-4. Estimated Amount of Herbicide per Acre of Treated Land After One Year

Herbicide	Maximum Application Rate Per Acre		Maximum Half-Life		Amount Of Herbicide Per Acre On-Site After 365 Days		Amount Of Herbicide Per Acre In Mg On-Site After 365 Days
2,4-D	6	pints	10	days	6.1739 E-11	pints	3.02 E -5 mg
Aminopyralid	7	oz	30	days	0.001522532	oz	51.2 mg
Fluroxypyr	2.6666	pints	36	days	0.002365093	pints	1,107.9 mg
Fosamine	3	gal	7	days	6.03333 E-16	gal	2.67 E–9 mg
Glyphosate	8	qt	25	days	0.000322145	qt	355.2 mg
Imazapic	12	oz	142	days	2.020258587	oz	65,114 mg
Imazapyr	6	pints	142	days	1.010129294	pints	511,400 mg
Metsulfuron methyl	4	oz	42	days	0.00968202	oz	420.8 mg
Sulfometuron methyl	8	oz	30	days	0.001740037	oz	76.2 mg
Triclopyr	3	gal	46	days	0.012260655	gal	50,122 mg

Source: Kimball, 2007

5.2.2 Bioaccumulation

The long-term fate of herbicides in the environment is also a concern. Bioaccumulation is the process by which chemicals enter the food chain from the environment, whereas biomagnification is the increase in concentration of these chemicals from one link in the food chain to the next. Small concentrations of chemicals, from combined effects of these processes, can lead to toxic effects especially for organisms high in the food chain. However, for biomagnification to occur, the chemical must be long-lived, mobile, and fat-soluble. If a chemical is not long-lived, it will break down before entering the food chain. If it is not mobile, such as when it is bonded to soil, it is unlikely that it could be taken up by an organism. If it is water-soluble rather than fat-soluble, it will be excreted by the organism (USDAFS, 2006). The herbicides proposed for use in this project appear to be rapidly excreted and do not accumulate in tissues. Therefore, these herbicides should present a low risk for biomagnification.

Foraging mammals and birds could possibly come into contact with treated areas. The chances of mammals or birds being directly sprayed would be small. The amount of herbicide absorbed would be very low, and toxic effects would be unlikely due to the low toxicity of herbicides proposed for use. However, this must be qualified by the fact that there is uncertainty regarding the toxicity of some herbicides and inert ingredients. The herbicides proposed for use, do not appear to bioaccumulate or biomagnify, so the probability of toxic effects on mammals or birds resulting from them eating contaminated prey would also be very low.

By adhering to all label instructions and protection measures, herbicide concentrations are expected to remain at safe levels and, therefore, negative impacts to mammals or birds should not occur. Positive impacts are expected over time because the action would be intended to increase restoration and increase ecological value. This conclusion assumes that project implementation and protection measures described in this BA are strictly followed.

5.2.3 Avoidance and Minimization Measures for the Federally Listed Bald Eagle, Red-Cockaded Woodpecker, and State-Listed Species

As described in the above sections, exposure of mammals and birds to herbicides may result from several actions, including direct spray application, ingestion of plants or other items that have been sprayed, grooming, indirect contact with vegetation that has been sprayed or inhalation of spray, and long-term exposure. Mammals and birds may come in contact with contaminated vegetation or ingest contaminated vegetation or prey; however, if all label instructions and protection measures are followed, herbicide concentrations are expected to remain at safe levels and therefore negative impacts to mammals and birds should not occur. Positive impacts are expected over time because the action would be intended to increase restoration and increase ecological value. This conclusion assumes that project implementation and protection measures described are followed. Eglin proposes the following avoidance and minimization measures for the federally listed bald eagle and red-cockaded woodpecker, as well as the state-listed burrowing owl and Florida black bear.

Bald Eagle

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the bald eagle if the following avoidance and minimization measures are followed:

- Herbicide applications would not occur within 1,500 feet of the nest site during the breeding season (1 October through 15 May).
- Aerial applications of herbicides that are known to cause eye damage would be prohibited; only ground applications of these herbicides would be permitted.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The bald eagle may be susceptible to direct or secondary effects of pesticides including bioaccumulation from prey; these chemicals are rapidly metabolized and eliminated from the systems of exposed animals and the herbicides do not tend to bioaccumulate in browsing wildlife. Therefore, no adverse impacts to the bald eagle are anticipated.

Red-Cockaded Woodpecker

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the red-cockaded woodpecker if the following avoidance and minimization measures are followed:

- Aerial applications of herbicides that are known to cause eye damage would be prohibited; only ground applications of these herbicides would be permitted.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The red-cockaded woodpecker may be susceptible to direct or secondary effects of pesticides including bioaccumulation from prey; these chemicals are rapidly metabolized and eliminated from the systems of exposed animals and the herbicides do not tend to bioaccumulate in browsing wildlife; therefore, no adverse impacts to the red-cockaded woodpecker are anticipated. The anticipated increase in available fuel sources would increase the opportunities and effectiveness of prescribed burns that would benefit red-cockaded woodpecker habitat. Reductions in hardwood species would benefit longleaf pine growth and regeneration, which is the preferred habitat of the red-cockaded woodpecker. Treatment of hardwoods would likely increase red-cockaded woodpecker food sources as insects infest the dying trees; treated woody species would also increase the availability of snags for use by wildlife. The implementation of long-term vegetation control could improve the value and carrying capacity of Eglin's RCW habitats.

Burrowing Owl

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the burrowing owl if the following avoidance and minimization measures are followed:

- Aerial applications of herbicides that are known to cause eye damage would be prohibited; only ground applications of these herbicides would be permitted.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The burrowing owl may be susceptible to direct or secondary effects of pesticides including bioaccumulation from prey; these chemicals are rapidly metabolized and eliminated from the systems of exposed animals and the herbicides do not tend to bioaccumulate in browsing wildlife. Therefore, no adverse impacts to the burrowing owl are anticipated. Reduction in intensive surface disturbances, such as roller drum chopping, could substantially reduce the

potential for destroying active and inactive gopher tortoise burrows, which are heavily used by the burrowing owl. Restoration of degraded longleaf pine sandhills could enhance the carrying capacity of the habitat to support an increase in gopher tortoise density, which could increase the availability of active and inactive burrow habitats for the burrowing owl. The anticipated increase in available fuel sources would increase the opportunities and effectiveness of prescribed burns that would benefit burrowing owl habitat.

Florida Black Bear

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the Florida black bear if the following avoidance and minimization measures are followed:

- Aerial applications of herbicides that are known to cause eye damage would be prohibited; only ground applications of these herbicides would be permitted.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The Florida black bear may be susceptible to direct or secondary effects of pesticides including bioaccumulation from prey; these chemicals are rapidly metabolized and eliminated from the systems of exposed animals and the herbicides do not tend to bioaccumulate in browsing wildlife. Therefore, no adverse impacts to the Florida black bear are anticipated.

5.3 HERBICIDE TOXICITY TO REPTILES

There are almost no data available regarding the toxicity of herbicides to reptiles. In a review of pesticide effects on reptiles, Pauli and Money (2000) found very few studies, despite publications stating the need for such research dating back to Hall (1980). Pauli and Money (2000) concluded, "it is remarkable that no data appear to exist concerning the effects on reptiles of field applications of… modern herbicides (e.g., glyphosate, sulfonylureas)…" Hall and Henry (1992) stated, "Susceptibility of reptiles to selective pesticides is virtually unknown" (Bautista, 2005).

Hall and Clark (1982) found that the green anole lizard (*Anolis carolinenesis*) had a similar sensitivity as mallards and rats to organophosphates. Conversely, reptiles were reported to be more sensitive to some pesticides than birds or mammals (Rudd and Genelly, 1956, as cited in Hall, 1980). Hall (1980) stated that reptiles are apparently less sensitive than fish. The FS/SERA risk assessments use amphibians and/or fish as surrogates for reptiles. An assumption is made that exposures and doses that are protective of amphibians and fish would also be protective of reptiles. Amphibians and fish have very permeable skin, moreso than reptiles, so they are more likely to absorb contaminants from their environment. Also, their complicated life cycle that

includes metamorphosis makes amphibians sensitive indicators for environmental effects (Cowman and Mazanti, 2000). However, the lack of data from reptiles leads to substantial uncertainty in the risk assessment for reptiles, since the response of these animals to doses of herbicide is not known. (Bautista, 2005)

Toxic effects on reptiles due to the use of herbicides under this Proposed Action are unlikely (Figure 5-2). Species such as snakes and turtles could occasionally ingest prey or vegetation that was sprayed with herbicides because they forage in areas that may receive treatment with herbicide. The herbicides proposed for use, have not been found to bioaccumulate or biomagnify. The herbicides proposed for use are of low toxicity, and the chance of these species receiving doses large enough to cause toxic effects is minimal. However, this must be qualified by the fact that there is uncertainty regarding the toxicity of some herbicides and inert ingredients.

Many reptile species would likely be under some cover during the day, when herbicides would be applied; the actual likelihood of exposing reptiles depends on the application method, size of treatment area, habitat treated, and season of application (Bautista, 2005). By adhering to all label instructions and protection measures, herbicide concentrations are expected to remain at safe levels and, therefore, negative impacts to reptiles should not occur. Positive impacts are expected over time because the action would be intended to increase restoration and increase ecological value. This conclusion assumes that project implementation and protection measures described in this BA are strictly followed.

5.3.1 Avoidance and Minimization Measures for the Federally Listed Eastern Indigo Snake and State-Listed Species

As described above, exposure to reptiles from herbicides may result from several actions including direct spray application, ingestion of plants or other items that have been sprayed, indirect contact with vegetation that has been sprayed or inhalation of spray, and long-term exposure. Reptiles may come in contact with contaminated vegetation or ingest contaminated vegetation or prey; however, by adhering to all label instructions and protection measures, herbicide concentrations are expected to remain at safe levels and, therefore, negative impacts to reptiles should not occur. Positive impacts are expected over time because the action would be intended to increase restoration and increase ecological value. This conclusion assumes that project implementation and protection measures described are followed. Eglin proposes the following avoidance and minimization measures for the federally listed eastern indigo snake, as well as the state-listed gopher tortoise.

Eastern Indigo Snake

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the eastern indigo snake if the following avoidance and minimization measures are followed:

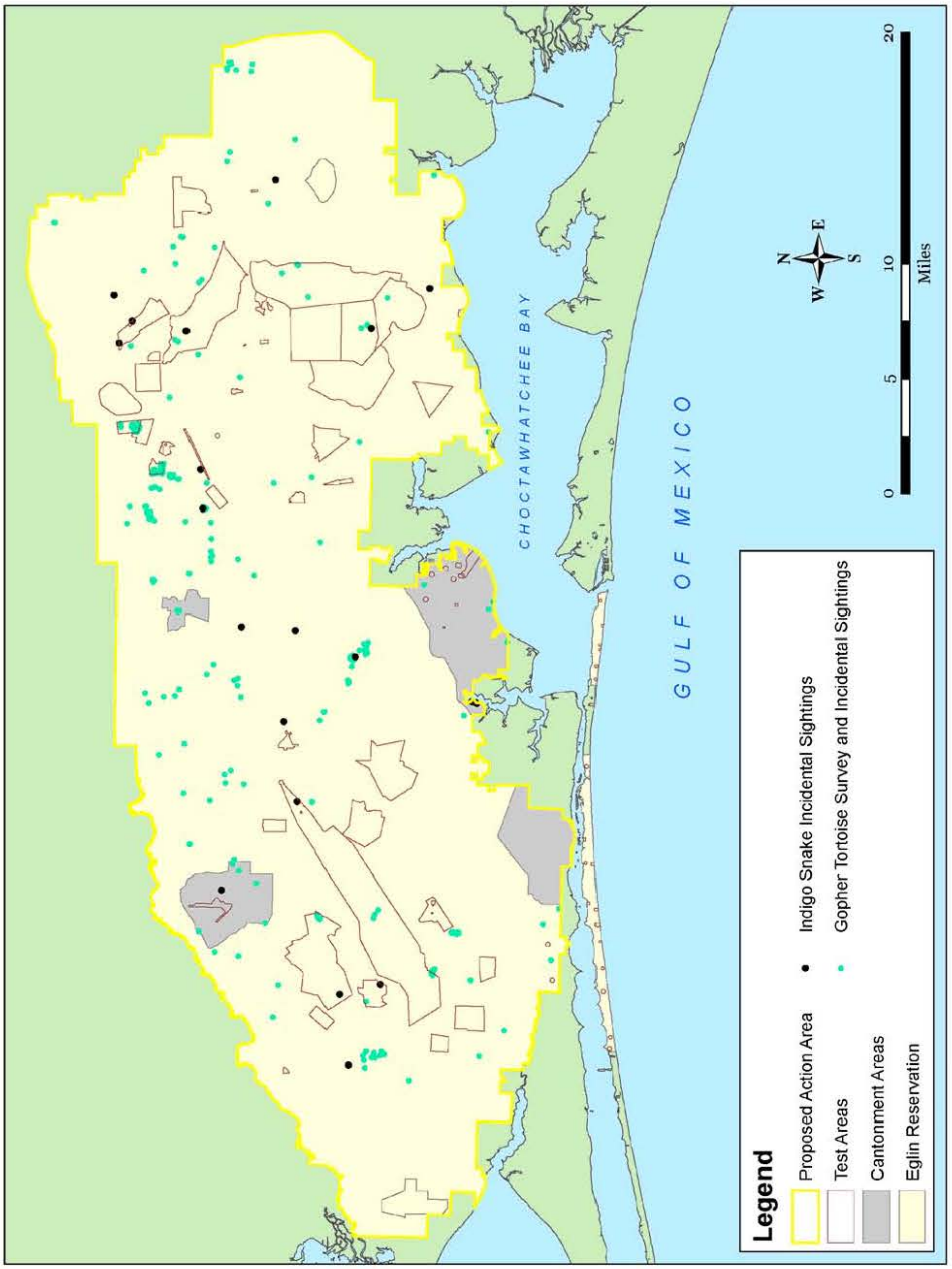

Figure 5-2. Reptiles on Eglin AFB

- Aerial applications of herbicides that are known to cause eye damage would be prohibited; only ground applications of these herbicides would be permitted.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The indigo snake may be susceptible to direct or secondary effects of pesticides including bioaccumulation from prey; these chemicals are rapidly metabolized and eliminated from the systems of exposed animals and the herbicides do not tend to bioaccumulate in browsing wildlife; therefore, no adverse impacts to the indigo snake are anticipated. Reduction in intensive surface disturbances, such as roller drum chopping, could substantially reduce the potential for destroying active and inactive gopher tortoise burrows, which are heavily used by the indigo snake. Restoration of degraded longleaf pine sandhills could enhance the carrying capacity of the habitat to support an increase in gopher tortoise density, which could increase the availability of active and inactive burrow habitats for the indigo snake. The anticipated increase in available fuel sources would increase the opportunities and effectiveness of prescribed burns that would benefit indigo snake habitat.

Gopher Tortoise

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the gopher tortoise if the following avoidance and minimization measures are followed:

- Aerial applications of herbicides that are known to cause eye damage would be prohibited; only ground applications of these herbicides would be permitted.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

Reduction in intensive surface disturbances, such as roller drum chopping, could substantially reduce the potential for destroying active and inactive gopher tortoise burrows. Restoration of degraded longleaf pine sandhills could enhance the carrying capacity of the habitat to support an increase in gopher tortoise density. The anticipated increase in available fuel sources would increase the opportunities and effectiveness of prescribed burns that would benefit gopher tortoise habitat. The implementation of the proposed long-term vegetation control could enhance the population viability of the gopher tortoise on Eglin.

5.4 HERBICIDE TOXICITY TO AMPHIBIANS AND FISH

Pesticides are among a number of proposed causes for global amphibian declines. Although a sizable database examining effects of pesticides on amphibians exists, the vast majority of these studies focus on toxicological effects (lethality, external malformations, etc.) at relatively high doses (parts per million). Very few studies focus on effects such as endocrine disruption at low concentrations (Hayes et al., 2006). Most studies examine exposures to single chemicals only. Hayes et al. (2006) examined larval growth and development, sex differentiation, and immune function in leopard frogs (*Rana pipiens*) and the effects of the nine-compound mixture on plasma corticosterone levels in male African clawed frogs (*Xenopus laevis*). Although some of the pesticides individually inhibited larval growth and development, the pesticide mixtures had much greater effects. Larval growth and development were retarded, but most significantly, pesticide mixtures negated or reversed the typically positive correlation between time to metamorphosis and size at metamorphosis observed in controls: exposed larvae that took longer to metamorphose were smaller than their counterparts that metamorphosed earlier. The nine-pesticide mixture also induced damage to the thymus, resulting in immunosuppression and contraction of flavobacterial meningitis. The study revealed that these adverse effects may be due to an increase in plasma levels of the stress hormone corticosterone. Although it cannot be determined whether all the pesticides in the mixture contribute to these adverse effects or whether some pesticides are effectors, some are enhancers, and some are neutral, the study revealed that estimating ecological risk and the impact of pesticides on amphibians using studies that examine only single pesticides at high concentrations may lead to gross underestimations of the role of pesticides in amphibian declines (Hayes et al., 2006).

Lyons (2006) indicates man-made endocrine-disrupting chemicals present a threat to biodiversity. Impaired reproduction, damaged brain function, and deficits of the immune system are of particular concern, and it must be recognized that proving the mechanism of action for some chemicals may take decades. Lyons (2006) suggests it is important to enable certain chemicals to be brought under stricter control on the basis of strong suspicion of endocrine disruption or biochemical signaling disruption. The widespread application of pesticides has attracted the attention of ecologists, and currently there is a struggle to understand the impacts of these chemicals on natural communities.

A diversity of pesticides and their residues are present in a wide variety of aquatic habitats. While pesticides have the potential to affect many aquatic taxa, the impacts on amphibians are of particular concern in the past decade because of the apparent global decline of many species. Pesticides occur in amphibian habitats, and amphibians living with insecticides in these habitats exhibit physiological signatures of these pesticides (i.e., reduced acetylcholine esterase activity) (Relyea et al., 2005). There are few rigorous experiments to confirm that pesticides are altering amphibian communities. It has been found that pesticides can have both direct and indirect effects in natural communities, and that these effects critically depend upon the composition of the community (Relyea et al., 2005).

Effects on terrestrial life stages of amphibians must be viewed somewhat differently. It is likely that adult or subadult amphibians within riparian zones would come into direct contact with herbicides during or after application. Chemical contamination was reviewed in Cooke (1981) and others (as reported in Maxell [2000]). Effects (although not necessarily from the specific

chemicals proposed for use in this document) ranged from mortality to reduced disease resistance, reproductive ability, and morphological abnormalities (Maxell, 2000). While amphibians' vulnerability to chemicals is well documented, there are no data that allow effective definition of what effects might occur from incidental contact with the herbicides proposed for use. Many assume that criteria for mammals, birds, and fish will incorporate the protection needed for amphibians (Maxell, 2000). For this analysis, it is assumed some risk to individuals may be present but impacts are not predictable; therefore, Eglin would increase avoidance and minimization measures for areas that may potentially hold sensitive amphibians.

Under the Proposed Action, direct contact with herbicides by amphibians would be largely incidental. The broader, more continuous coverage (aerial application) of nonaquatic labeled herbicides would not occur in riparian zones, where sensitive amphibians are likely to be found in large numbers (Figure 5-3). Ground application consists largely of spot application, reducing risk of exposure for high numbers of individuals. Amphibian species can occur in extremely high densities around water bodies, shortly after they metamorphose from tadpoles into young adults. This situation can pose a risk to relatively large number of individuals during ground application in the riparian zones.

Based on short exposure times and likely concentration levels that are well below those shown to cause adverse effects on aquatic organisms, it is concluded that risk for adverse effects on fish and amphibian species in surface waters is low enough to be considered insignificant.

By adhering to all label instructions and protection measures, herbicide concentrations in streams are expected to remain at safe levels and, therefore, significant negative impacts to fish and amphibians should not occur. A general comparison of lethal toxicity levels (LC_{50}) for fish and other aquatic species exposed to certain herbicides are provided in the Table 5-5. Given the small potential for unknown impacts due to a lack of current knowledge, Eglin would use conservative buffers on all herbicide applications that have the potential to impact fish and amphibians (Figures 5-3 and 5-4).

5.4.1 Avoidance and Minimization Measures for the Federally Listed Flatwoods Salamander, Gulf Sturgeon, Okaloosa Darter, and State-Listed Species

Risk of impacting sensitive fish and aquatic life stages of amphibians is directly related to possible herbicide contamination of streams, wetlands, and lakes, and the necessity for water quality conditions to allow individuals to remain healthy throughout all life stages of development and maturation. Risk is indirectly related to effects on aquatic insects, used for food, and riparian and upslope vegetation, necessary to maintain many physical elements of desired habitat characteristics.

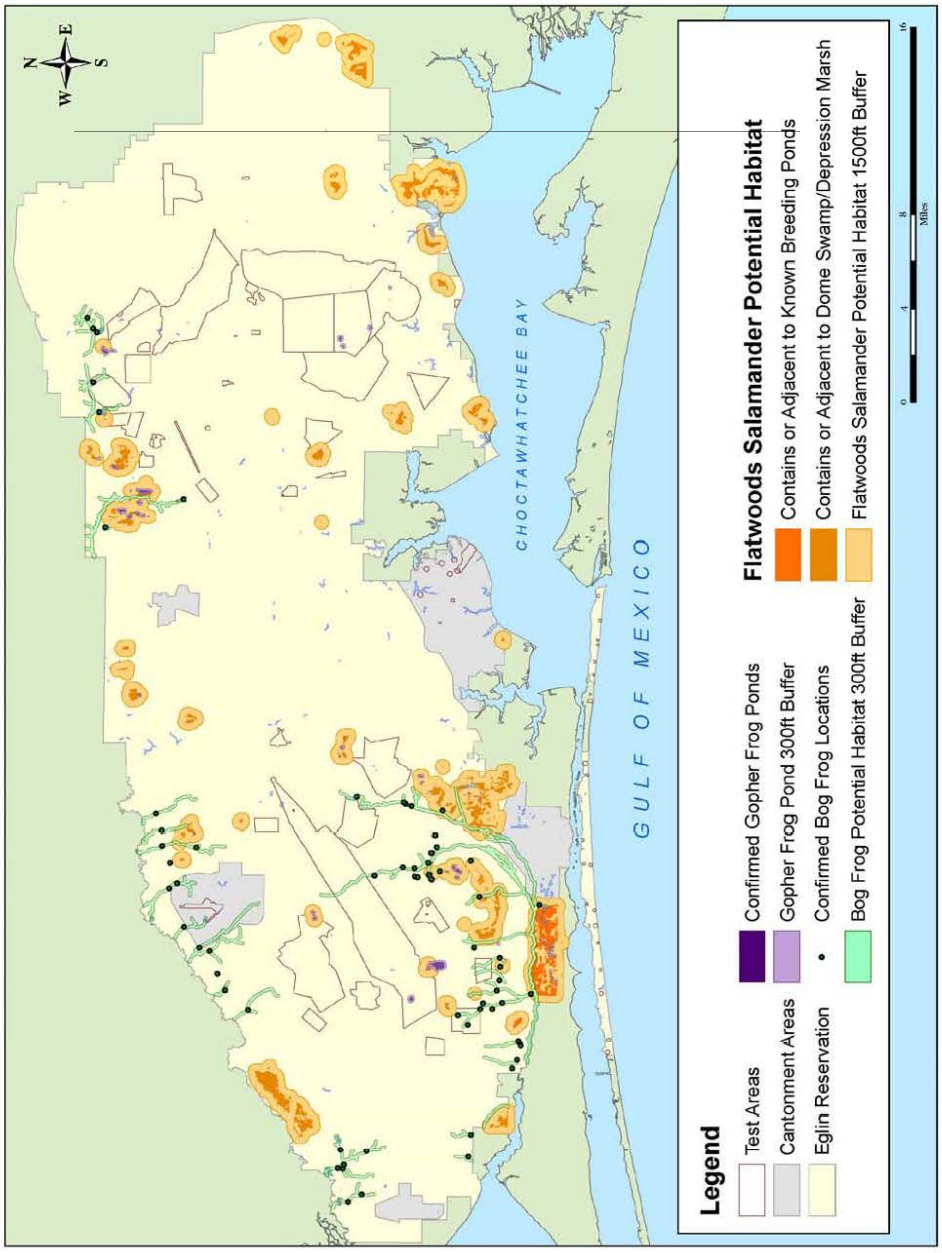

Figure 5-3. Amphibians on Eglin AFB

Table 5-5. Potential Effects on Aquatic Organisms

Chemical Name	Effects on Aquatic Organisms
2,4-D	2,4-D forms range from being practically nontoxic to highly toxic to fish and aquatic invertebrates. 2,4-D amine salt forms are generally nontoxic to fish. Those compounds most toxic to fish include the 2,4-D ester formulations, N-oleyl-1,3-propylenediamine salt, and N,N-dimethyl-oleyl-linoleylamine.
Aminopyralid	Aminopyralid is practically nontoxic to fish and aquatic invertebrate animals. It does not build up (bioaccumulate) in fish.
Fluroxypyr	The toxicity of fluroxypyr to fish and aquatic invertebrates ranges from slightly toxic to highly toxic depending on the formulation of herbicide.
Fosamine	The toxicity of fosamine ammonium to fish and aquatic invertebrates is low (USEPA, 1995). There is no evidence that fosamine bioaccumulates in fish (USEPA ,1995).
Glyphosate	Glyphosate is no more than slightly toxic to fish and practically nontoxic to aquatic invertebrate animals. It does not build up (bioaccumulate) in fish. The Accord and Rodeo formulations are practically nontoxic to freshwater fish and aquatic invertebrate animals. The Roundup formulation is moderately to slightly toxic to freshwater fish and aquatic invertebrate animals due to its premixed nonaquatic surfactant. Glyphosate and its formulations have not been tested for chronic effects in aquatic animals.
Imazapic	Imazapic ranks as a "low risk" herbicide for fish, classed in the same category as 2,4-D, glyphosate, and metsulfuron methyl. Neither published literature nor the USEPA files include data regarding the toxicity of imazapic to amphibian species. Aquatic organisms appear to be relatively insensitive to imazapic exposure, relative to both direct toxicity and reproductive effects.
Imazapyr	Imazapyr and its formulations are low in toxicity to invertebrates and practically nontoxic to fish. Imazapyr is not expected to accumulate or build up in aquatic animals. Imazapyr and its formulations have not been tested for chronic effects in aquatic animals.
Methsulfuron methyl	Metsulfuron methyl is practically nontoxic to fish and aquatic invertebrates. Metsulfuron methyl does not build up (bioaccumulate) in fish.
Sulfometuron methyl	Sulfometuron methyl is slightly toxic to fish and aquatic invertebrates. The potential for sulfometuron methyl to build up in fish tissues (bioaccumulate) is low.
Triclopyr	Triclopyr is low in toxicity to fish. The ester form of triclopyr, found in Garlon 4, is more toxic, but under normal conditions, it rapidly breaks down in water to a less toxic form. Triclopyr does not accumulate in fish. Triclopyr is slightly toxic to practically non-toxic to invertebrates. Triclopyr and its formulations have not been tested for chronic effects in aquatic animals.

Source: USDAFS, 2006

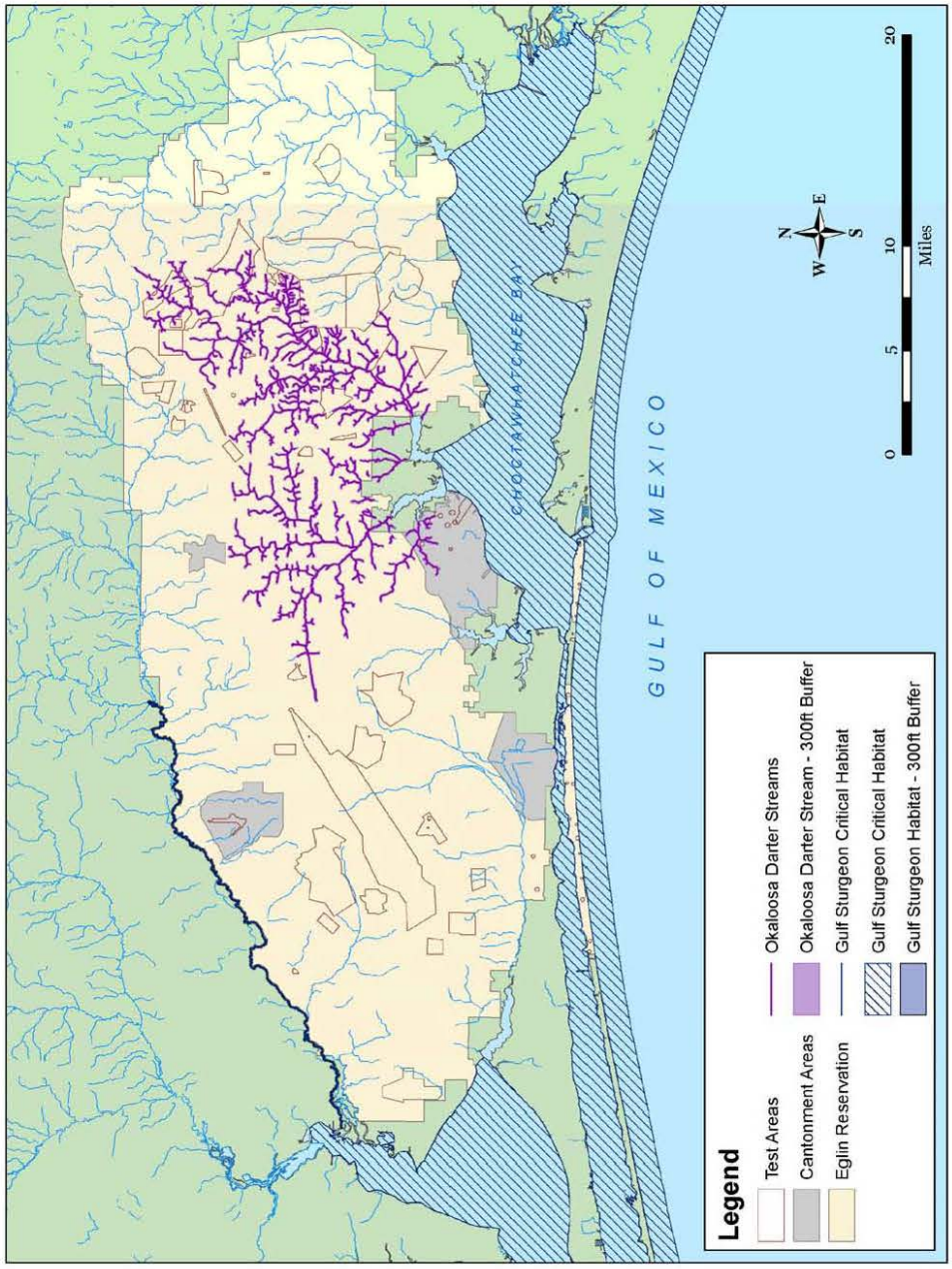

Figure 5-4. Okaloosa Darter and Gulf Sturgeon on Eglin AFB

By adhering to all label instructions and protection measures, herbicide concentrations in streams are expected to remain at safe levels and, therefore, negative impacts to sensitive species or sensitive habitats should not occur. The application of these herbicides would meet all water quality standards and maintain beneficial uses of surface water and groundwater resources. This conclusion assumes that project avoidance and minimization measures described are followed.

Susceptibilities to chemical treatments are not well defined for amphibian species, as with other aquatic organisms. Their life histories involve both aquatic and terrestrial life stages, making them susceptible to toxicants in both environments. Many amphibians have vascularization in the epidermis of the skin, with little keratinization, simplifying uptake of many toxicants. Given the lack of data and recent emphasis on potential impacts to amphibians from chemicals, Eglin proposes the following avoidance and minimization measures for the federally listed flatwoods salamander, Gulf sturgeon and Gulf sturgeon critical habitat, and Okaloosa darter, as well as the state-listed dusky gopher frog and Florida bog frog, to ensure that no significant impacts from the Proposed Action would occur.

Flatwoods Salamander

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the flatwoods salamander if the following avoidance and minimization measures are followed:

- Aerial herbicide applications would not occur within 1,500 feet of confirmed flatwoods salamander habitat (FNAI Category 1) and potential flatwoods salamander habitat (FNAI Category 2).
- Aquatic labeled herbicides (manual ground applications only) would only be used for exotics and in habitat restoration projects within confirmed and potential salamander buffer zones outside the breeding season (May through September); nonaquatic labeled herbicides would be prohibited.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The anticipated increase in available fuel sources would increase the opportunities and effectiveness of prescribed burns that would benefit flatwoods salamander habitat.

Gulf Sturgeon and Gulf Sturgeon Critical Habitat

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the Gulf sturgeon or Gulf sturgeon critical habitat if the following avoidance and minimization measures are followed:

- A 300-foot buffer would be required for all nonaquatic labeled herbicides that are toxic to fish and/or herbicides that are highly mobile and have the potential to contaminate groundwater around designated Gulf sturgeon critical habitat.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The use of herbicides for long-term vegetation control would increase management tools for reducing surface disturbances and subsequent soil erosion potentials associated with the use of mechanical control methods (mowing and bush-hogging), thus decreasing sedimentation potentials that degrade Gulf sturgeon critical habitat. The use of herbicides could promote herbaceous ground cover, which would result in decreased soil erosion rates that would, in turn, improve Gulf sturgeon critical habitat.

Okaloosa Darter

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the Okaloosa darter if the following avoidance and minimization measures are followed:

- A 300-foot buffer would be required for all nonaquatic labeled herbicides that are toxic to fish and/or herbicides that are highly mobile and have the potential to contaminate groundwater around Okaloosa darter streams.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The use of herbicides for long-term vegetation control would increase management tools for reducing surface disturbances and subsequent soil erosion potentials associated with the use of mechanical control methods (mowing and bush-hogging), thus decreasing sedimentation potentials that degrade Okaloosa darter habitat. The use of herbicides could promote herbaceous ground cover, which would result in decreased soil erosion rates, which, in turn, would improve stream habitats.

Dusky Gopher Frog

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the dusky gopher frog if the following avoidance and minimization measures are followed:

- Applications of nonaquatic labeled herbicides would not occur within 300 feet of known dusky gopher frog habitat.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

Reduction in intensive surface disturbances, such as roller drum chopping, could substantially reduce the potential for disturbance of the dusky gopher frog habitat. The anticipated increase in available fuel sources would increase the opportunities and effectiveness of prescribed burns that would benefit dusky gopher frog habitat.

Florida Bog Frog

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** the Florida bog frog if the following avoidance and minimization measures are followed:

- Applications of nonaquatic labeled herbicides would not occur within 300 feet of known Florida bog frog habitat.
- All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns by an endangered species biologist before conducting herbicide application activities in endangered species habitat.
- GPS files would be provided to the certified applicator to delineate the areas to be treated and places to avoid.

The anticipated increase in available fuel sources would increase the opportunities and effectiveness of prescribed burns that would benefit Florida bog frog habitat.

5.5 SENSITIVE PLANTS

There are numerous sensitive plant species on Eglin AFB. The risk that herbicides would be accidentally sprayed on sensitive plants is very low for most species due to proximity to current infestations of INPS. Broadcast applications may impact individuals or habitat but would not be likely to contribute to a trend toward listing or loss of viability to the population or species. Herbicide treatments may lead to increasing ecological value in the area by reducing INPS.

5.5.1 Sensitive Plant Habitats

Herbicide use in or near sensitive habitats at Eglin AFB could result in both beneficial and harmful impacts (Figure 5-5). Potential negative impacts include a reduction in understory diversity due to unintentional kill-off of nontargeted species and water quality degradation from runoff. Beneficial effects would include native plant community restoration and INPS control.

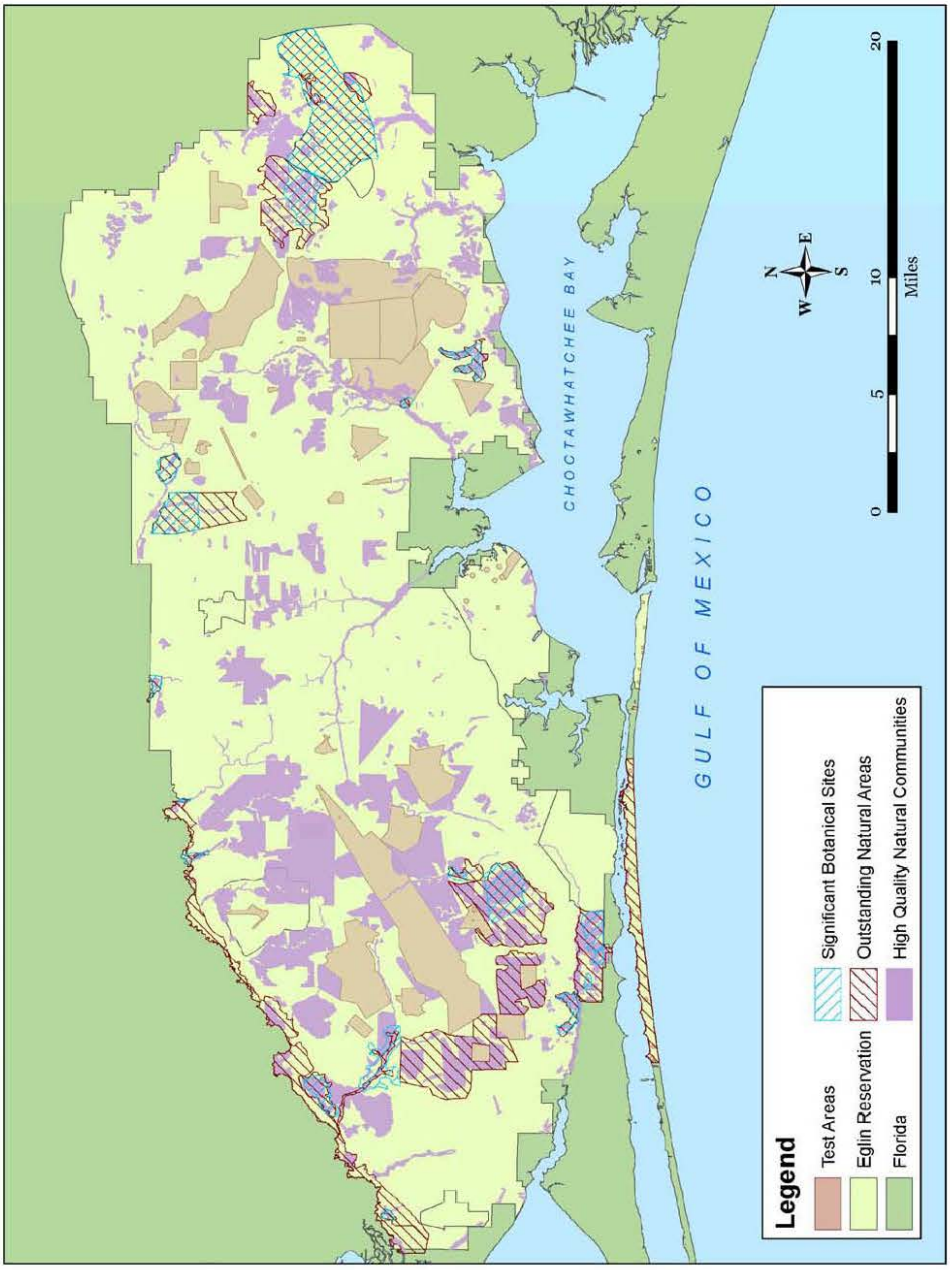

Figure 5-5. Sensitive Habitats on Eglin AFB.

Outstanding Natural Areas, Significant Botanical Sites, and High Quality Natural Communities are important for long-term ecological research and as reference conditions for restoration actions on the installation. The ecological qualities of these areas require that management be carried out with a higher level of scrutiny, especially with regard to the high quality herbaceous ground cover and high density of rare species.

Some herbicide use may be beneficial in ONAs, SBSs, and HQNCs for the control of INPS and for the restoration of native plant communities. In sandhills habitat, such as the Patterson Natural Area, the NRS has used hexazinone to restore RCW habitat, specifically to supplement fire and to get the habitat in a condition where it could be burned (Walker, 2006). Herbicide treatments have also been used to reduce fuels in areas that cannot be burned due to urban interface issues or other restrictions. INPS control efforts also utilize herbicides, including treatments to control Japanese climbing fern in the Briar Creek Special Natural Area (U.S. Air Force, 2006).

Previous work at Eglin AFB showed that shrubs in the understory and woody native species like blueberries, bracken fern, gopher apple, and paw paw were negatively affected by broadcast hexazinone (Provencher et al., 2001). Because many of the rare species in these sensitive habitats are understory plants, broadcast herbicide use could negatively impact these communities. Targeted herbicide treatments using the pronone brush bullet, cut-and-squirt methods, or other targeted methods would minimize collateral damage of the herbicide.

The primary concern for aquatic sensitive habitats (ONAs, SBSs, and HQNCs that contain aquatic elements) is potential water quality degradation from runoff. Table 2-2 provides details on the environmental hazards associated with the proposed herbicides. Restriction of aerial application of nonaquatic labeled pesticides near these aquatic sensitive habitats would minimize the potential for runoff of harmful herbicides into aquatic environments. Also, timing the application of herbicides to avoid upcoming rain events would minimize runoff potential.

Locations of sensitive habitats would need to be digitized using GPS/GIS and the files provided to aerial herbicide applicators so they could avoid these habitats, unless application in these areas is specifically approved by the NRS. Any treatments in ONAs, SBSs, or HQNCs would require approval from the NRS, including specifics on application method, herbicide type, buffers, and timing. Eglin NRS does not anticipate negative impacts to sensitive habitats from long-term vegetation control activities, and sensitive habitats would likely show beneficial response to targeted herbicide use under the guidance of the NRS.

5.5.2 Avoidance and Minimization Measures for Native Plant Species

Eglin NRS has determined that the application of herbicides for long-term vegetation control on Eglin is **not likely to adversely affect** native plant species if the following avoidance and minimization measures are followed:

- Any treatments in ONAs, SBSs, or HQNCs would require approval from the NRS, including specifics on application method, herbicide type, buffers, and timing.
- Sensitive habitat locations would be digitized using GPS/GIS. The files would be provided to herbicide applicators to avoid the areas, unless application in such areas is specifically approved by the NRS.
- Restrict aerial application of nonaquatic label pesticides near aquatic sensitive habitats.
- Time the application of herbicides to avoid upcoming rain events.

6. CONCLUSION

This BA evaluates the potential impacts to threatened and endangered species for the long-term vegetation control on Eglin AFB. The Proposed Action has varying potential impacts based on the scope of activities and relation to species habitat. To mitigate these potential impacts, Eglin AFB would adhere to avoidance and minimization measures listed in Chapter 5.

The Air Force proposes to implement a vegetation management program on Eglin AFB that integrates the beneficial attributes of a variety of herbicides and prescribed burning techniques for achieving environmentally sound vegetation management and accommodating the performance requirements of test area military missions. The Proposed Action involves the approval for and use of various herbicides on Eglin AFB for land test area maintenance, line of site maintenance, helicopter landing zone maintenance, red-cockaded woodpecker and native ecosystem restoration, INPS control, and native plant nursery development. The goal of the proposed program is to reduce and/or phase out current mechanical vegetation management practices and allow for chemical vegetation management in areas where mechanical means are not possible. Program implementation would reduce vegetation control operation costs, erosion and stream sedimentation, and impacts to sensitive species and habitat associated with land test areas. The Proposed Action would provide Eglin AFB natural resource managers with flexible vegetation management tools to achieve a more natural and diverse forest structure.

All herbicide applicators conducting herbicide treatment activities on Eglin AFB would be DoD- or state-certified pesticide applicators or qualified individuals under direct supervision of a certified applicator. The INPS applicators would be trained in the proper identification of both INPS and native species. An Eglin AFB endangered species biologist would manage and oversee all herbicide contracts for the control of INPS. All applicators (including contractors and their staff) would be briefed on any potential endangered species concerns before conducting herbicide application activities in endangered species habitat; contract clauses would require endangered species coordination. Herbicide labels and instructions would be adhered to during handling, mixing, and application of all herbicides. GPS files, detailed maps and/or ground-marking, or GIS electronic files would be provided to the applicator to delineate the areas to be treated and places to avoid. For aerial applications, the aircraft would be required to use GPS. The aircraft GPS would be used to determine aerial herbicide application location, pattern, and rate. The aircraft would use a single-pass pattern with no overlap. The applicator would be required to use the Air Force's GPS and GIS electronic files to determine treatment areas and coordinate with the Air Force to ensure compatibility (projection and coordinate system) of the electronic files with the aircraft GPS. Sensitive areas would not receive herbicide (unless an aquatic label can be used). These locations would be digitized using GPS or GIS and the files provided to the applicator. Sensitive areas include water bodies, areas adjacent to water bodies, sites without vegetation, and certain sensitive habitats as determined by the Eglin NRS. Areas to be avoided due to concerns for threatened and endangered species would be identified through coordination with endangered species biologists.

Eglin AFB would notify the USFWS immediately if it modifies any of the actions considered in this Proposed Action or if additional information on listed species becomes available, as the USFWS may require a reinitiation of consultation. If impact to listed species occurs beyond

Conclusion

what Eglin has considered in this assessment, all operations would cease and Eglin would notify the USFWS. Prior to commencement of activities, Eglin would implement any modifications or conditions resulting from consultation with the USFWS. Eglin NRS believes this fulfills all requirements of the ESA, and no further action is necessary.

Signatures

7. SIGNATURES

INFORMAL CONSULTATION REGARDING

IMPACTS TO FEDERALLY LISTED SPECIES
RESULTING FROM LONG-TERM VEGETATION CONTROL
EGLIN AIR FORCE BASE, FLORIDA

Prepared by: _____ _____
Kelly Knight — Date
Environmental Scientist, SAIC
Eglin Natural Resources Section

Reviewed by: _____ _____
Bob Miller — Date
Endangered Species Biologist
Eglin Natural Resources Section

_____ _____
Bruce Hagedorn — Date
Chief, Wildlife Element
Eglin Natural Resources Section

_____ _____
Stephen M. Seiber — Date
Chief, Eglin Natural Resources Section

USFWS CONCURRENCE:

_____ _____
Project Leader — Date
U.S. Fish and Wildlife Service
Panama City, FL

FWS Log No. _____

Signatures

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH AIR BASE WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Mr. Stephen M. Seiber
Chief, Eglin Natural Resources
501 De Leon Street, Suite 101
Eglin AFB FL 32542-5133

06 APR 2007

Ms. Janet Mizzi
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City FL 32405

Dear Ms. Mizzi:

The attached biological assessment is being submitted to fulfill requirements under Section 7 of the Endangered Species Act (ESA). This Biological Assessment assesses potential impacts to the bald eagle, Eastern indigo snake, flatwoods salamander, Gulf sturgeon, Gulf sturgeon critical habitat, Okaloosa darter and red-cockaded woodpecker associated with the long-term vegetation control on Eglin Air Force Base (AFB), Florida.

The Proposed Action involves the approval for and use of various herbicides on Eglin AFB for land test area maintenance, line of site maintenance, helicopter landing zone maintenance, red-cockaded woodpecker (RCW) and native ecosystem restoration, invasive nonnative plant species control, and native plant nursery development. The Air Force proposes to use herbicides on Eglin's test areas and interstitial areas to control vegetation including, but not limited to, live oak, laurel oak, turkey oak, and waxy shrubs such as gallberry, greenbrier, and wax myrtle.

The Air Force needs to maintain many of the Eglin AFB land test areas as grassy habitat in order to allow unimpeded observations and lines-of-sight for evaluating munitions tests. The approval of additional herbicides would allow application in all seasons and would allow longleaf restoration in flatwoods and other habitats. The Proposed Action would improve current RCW and ecosystem restoration efforts and reduce sedimentation impacts to the Okaloosa darter.

Eglin Natural Resources section has determined that the Proposed Action is not likely to adversely affect the bald eagle, Eastern indigo snake, flatwoods salamander, Gulf sturgeon, Okaloosa darter, red-cockaded woodpecker and not likely to adversely modify Gulf sturgeon critical habitat. Avoidance and Minimization Measures would serve to significantly mitigate potential impacts from long-term vegetation control activities.

If you have any questions regarding this letter or any of the proposed activities, please do not hesitate to contact either Mr. Bob Miller (850) 883-1153 or myself at (850) 882-8391.

Sincerely,

STEPHEN M. SEIBER, YF-2

Attachment:
Informal Biological Assessment for Long-Term Vegetation Control

Appendix D-2

USFWS Amendment Letter to Biological Assessment

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH AIR BASE WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Mr. Stephen M. Seiber
Chief, Natural Resources Section
96 CEG/CEVSN
501 De Leon Street, Suite 101
Eglin AFB FL 32542-5133

Ms. Janet Mizzi
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City FL 32405

Dear Ms. Mizzi:

The following information is being submitted as an amendment to Section 7 consultation under the Endangered Species Act (ESA) for the Long-Term Vegetation Control Informal Biological Assessment. The Biological Assessment (BA) was submitted on April 6, 2007 for the potential impacts to the federally listed bald eagle, eastern indigo snake, flatwoods salamander, Gulf sturgeon, Gulf sturgeon critical habitat, Okaloosa darter and red-cockaded woodpecker (RCW) associated with the long-term vegetation control on Eglin Air Force Base (AFB), Florida. The BA also addressed potential impacts to the following state-listed species: burrowing owl, dusky gopher frog, Florida black bear, Florida bog frog, and gopher tortoise as well as sensitive plant habitats.

The intent of the Proposed Action analyzed in the BA is ecological restoration through management of vegetation on the Eglin reservation by restoring RCW habitat, controlling invasive non-native plant species, and restoring native ecosystems. The vegetation control measures would also allow for more effective terrestrial test area maintenance, range control tower line-of-site maintenance, and helicopter landing zone maintenance. Herbicide treatments would continue as needed to control vegetation, but intensity of treatments with herbicides would be reduced after the initial application, and prescribed fire would be used for long-term maintenance. At USFWS request, we are submitting this amendment letter to address concerns discussed in meetings between Eglin Natural Resources Section (NRS) and the USFWS on May 14 and 24, 2007 as well as the corresponding email dated May 25, 2007. The following concerns are addressed:

USFWS comment:

The toxicity of some of the herbicides listed for proposed use have higher toxicity (Class I and Class II) associated with them than other proposed herbicides (Class III). The safe exposure

levels estimated by the US Environmental Protection Agency provided via the respective material safety data sheets (MSDS) reflect exposures that will vary from the on the ground concentrations estimated for these applications due to uncontrollable environmental factors.

For these reasons, USFWS recommends that Eglin reduce the number of herbicides proposed and minimize herbicide redundancy by removing all Class I and Class II toxics where target species redundancy exists with less toxic alternatives. Specific herbicides to consider removing from approval consideration include: 2,4-D Amine (Class I), Fluroxypyr (Class II), Fosamine (Class II), Glyphosate (Class II), Metsulfuron methyl (Class II), and Triclopyr (Class I). According to Table 2-3 in the Biological Assessment, Fosamine being a pine selective herbicide, is the only herbicide that is not redundant with Imazypyr in terms of target control species. This will reduce the toxicity to, and exposure risk for, Eglin's natural resources and also reduce uncertainty stemming from unforeseen impacts related to herbicide applications.

Eglin NRS response:

Eglin NRS would remove Class I herbicide 2,4-D from the list of proposed herbicides. Class I herbicide Triclopyr TEA is the aquatic formulation of triclopyr. Triclopyr TEA would primarily be used to manage test ranges where waxy-leaved plants adjacent to aquatic habitats need to be controlled and would not be used in any federally listed threatened or endangered species habitat or buffer. Herbicide treatments would continue as needed to control vegetation, but intensity of treatments with herbicide would be reduced after the initial application, and prescribed fire would be used for long-term maintenance. All Class II herbicides are needed for seasonal, habitat, and physical differences for target plant species and are necessary in order to protect certain non-target species. Additionally, the herbicides are applied with a dilutant such as water, which reduces the toxicity identified on the MSDS of the formulated herbicide. Eglin NRS has selected these herbicides based not only on the target species that would be affected by application, but also the non-target species that would remain unaffected by application. Any application or site that has not been analyzed within this Biological Assessment and amendment letter would require separate consultation, and Eglin AFB would initiate such consultation if necessary.

USFWS comment:

The red-cockaded woodpecker (RCW) recovery plan (2003, second revision) states "Use of mechanized equipment in a cluster is permitted during the non-breeding season for red-cockaded woodpeckers only (e.g. mechanical midstory reduction). Habitat management activities other than prescribed burning are prohibited during the breeding season (April – July)". USFWS would concur with Eglin NRS "not likely to adversely affect" determination for the RCW provided that Eglin include the following commitments:

- In the event of ground application of herbicides within an RCW cluster using mechanized equipment, operations would not occur during the RCW nesting season.
- In the event of manual application of herbicides within an RCW cluster, procedures outlined in the consultation for "Hexazinone Application on Interstitial Areas"

(September 25, 2001) would be followed or further coordination with USFWS would take place.

Eglin NRS response:

Eglin NRS concurs with the USFWS comment and would abide by the RCW Recovery Plan and Hexazinone on Interstitial Forest Areas Biological Assessment management requirements for RCW as suggested.

USFWS comment:

Provision of monitoring results would be advantageous to the USFWS conservation mission. It was stated during discussions that monitoring would be conducted to examine the efficacy of the applications for each intended vegetation control. It was also noted that the data collected would vary from more complete understory effects monitoring to data collected as possible for ranges with limited accessibility. Because the data are being collected and could prove important in future conservation recommendations, Eglin stated that the monitoring results would be provided to the Service annually for review. This would ideally include data from all application types that could be provided via a summary assessment of the on the ground results. As per the discussions, Eglin would use this information to evaluate success and future needs for applications. The inclusion of this cumulative data on an annual basis would provide the most accurate representation of the results of the habitat enhancement and land maintenance actions. The USFWS expects that data would be collected for all applications and therefore would be available for all habitats undergoing herbicide treatments. The USFWS also understood that the data would be collected at a level relative to the application and expected outcome. Anecdotal information on the presence of gopher tortoise and other species of interest was also noted as possible from these monitoring activities and could be provided to the USFWS for conservation benefits.

Eglin NRS response:

Eglin's Ecological Monitoring Program currently has 201 long-term monitoring plots which are used to evaluate ecological conditions over time as it relates to natural resource management (Figure 1). Any herbicide applications that fall within one of the 201 plots would cause the plot to be re-sampled after one growing season. Ecological monitoring supports adaptive management by informing managers of community change resulting from management actions. If impacts are negative (*e.g.*, loss and degradation of ecosystem function and processes, degradation of site condition, etc.), management practices can be altered. Alternatively, management actions that prove to have ecologically beneficial outcomes can be perpetuated. In addition to providing information collected from the monitoring plots, Eglin would provide the USFWS with an annual report providing the following information:

- Date(s) of herbicide application.
- Name and type of herbicide used.
- Location of herbicide application.

- Type of application method used.
- Quantity of herbicide used.
- Observed vegetative response to the herbicide in the treated area.
    - Level of elimination/reduction of target species.
    - Effect on non-target species, whether enhanced or harmed.
- Monitoring plot(s) within treated area.
    - Applicable data collected from long-term monitoring plot site(s).
    - Any additional monitoring data collected at previous research sites or specific treatment areas where herbicides have been applied in the past.

USFWS comment:

There was good discussion of concerns for potential effects to less noticeable plant species not normally referred to as "groundcover" and for effects to prey species of reptiles and amphibians. Some of these concerns may be minimized by the types of chemicals that are ultimately selected, but further research is needed to follow up on previous recommendations from The Nature Conservancy's studies and literature review (Provencher, Litt, et al.). Research proposals and monitoring as noted above should be included in the project.

Eglin NRS response:

Previous research has been completed on this subject. Eglin would continue monitoring these research plots to aid in future management decisions regarding the use of herbicides on Eglin. Eglin would investigate possible joint research projects with local universities regarding the effects of herbicides.

USFWS comment:

Application of herbicides within the 1,500-ft buffer of known flatwoods salamander ponds has the potential for "take." It was noted that control of invasive exotic species within the buffer is desirable and should be addressed under a previous consultation. Control of native species is not anticipated, but if necessary, it should be limited to basal spraying, cut stump application, and/or injection only. Other methods could be addressed through future consultations if needed.

Eglin NRS response:

Eglin NRS would not use any herbicides in suitable habitat within the 1500-ft buffer of known or potential flatwoods salamander ponds with the exception of invasive exotic species control efforts previously approved under a separate consultation (USAF, 2002). The amphibian map has been revised to show the 1500-ft buffer around all known and potential flatwoods salamander ponds (Figure 2). The previous amphibian map included in the BA showed a buffer around Florida Natural Areas Inventory classified potential habitat polygons making the

exclusion areas larger than necessary. Furthermore, Eglin would not use any herbicides within the 300-ft buffer of known Florida bog frog habitat and known gopher frog ponds (Figure 2). If the habitat changes or becomes degraded within these buffers, Eglin NRS would reinitiate consultation regarding the use of herbicides within the buffers.

USFWS comment:

Broadcast application between known flatwoods salamander ponds in the East Bay Flatwoods is not anticipated, but also could be addressed through future consultations.

Eglin NRS response:

Any application or site that has not been analyzed within this Biological Assessment and amendment letter would require separate consultation, and Eglin AFB would initiate such consultation if necessary.

USFWS comment:

For potential salamander habitat, Eglin staff would re-evaluate the findings of the Virginia Tech surveys to determine if some areas should be removed (or added) due to conditions noted during field inspections. The 1,500-ft buffer of good potential ponds should be treated as known ponds. This could be addressed with further analysis within the BA, or it could be handled through future consultations on individual projects. The Basin Bayou longleaf restoration project may or may not be a concern based on re-evaluation of the Virginia Tech habitat analysis.

Eglin NRS response:

The 1500-ft buffer around potential ponds would only apply to suitable flatwoods habitat. If it is determined by Eglin NRS that the buffer includes habitat that is not usable by flatwoods salamanders, such as sand pine or upland sandhill, then those areas would be excluded from protection. The Basin Bayou longleaf restoration project or any other restoration treatment in known or good potential flatwoods salamander habitat (as determined by the NRS) would be addressed in a separate consultation.

The Proposed Action has varying potential impacts based on the scope of activities and relation to species habitat. Eglin Natural Resources Section has determined that the Proposed Action is **not likely to adversely affect** the bald eagle, eastern indigo snake, flatwoods salamander, Gulf sturgeon, Okaloosa darter and red-cockaded woodpecker and **not likely to adversely modify** Gulf sturgeon critical habitat with the additional conditions addressed in this amendment letter.

Eglin AFB would notify the USFWS immediately if it modifies any of the actions considered in this Proposed Action or if additional information on listed species becomes available, as the USFWS may require a reinitiation of consultation. If impact to listed species occurs beyond what Eglin has considered in the assessment, all operations would cease and Eglin

would notify the USFWS. Prior to commencement of activities, Eglin would implement any modifications or conditions resulting from consultation with the USFWS. Eglin NRS believes this fulfills all requirements of the ESA, and no further action is necessary

If you have any questions regarding this letter or any of the proposed activities, please do not hesitate to contact either Mr. Bob Miller (850) 883-1153 or myself at (850) 882-8391.

Sincerely,

STEPHEN M. SEIBER, YF-2
Chief, Natural Resource Section

Attachments:
Figures 1, 2

References

U.S. Air Force, 2002. Informal Biological Assessment to Determine Potential Impacts to Federally Listed Endangered Species Resulting from the Application of Herbicides to Treat INPS on Eglin's Range. FWS Log. No. 4-P-02-229. 29 August.

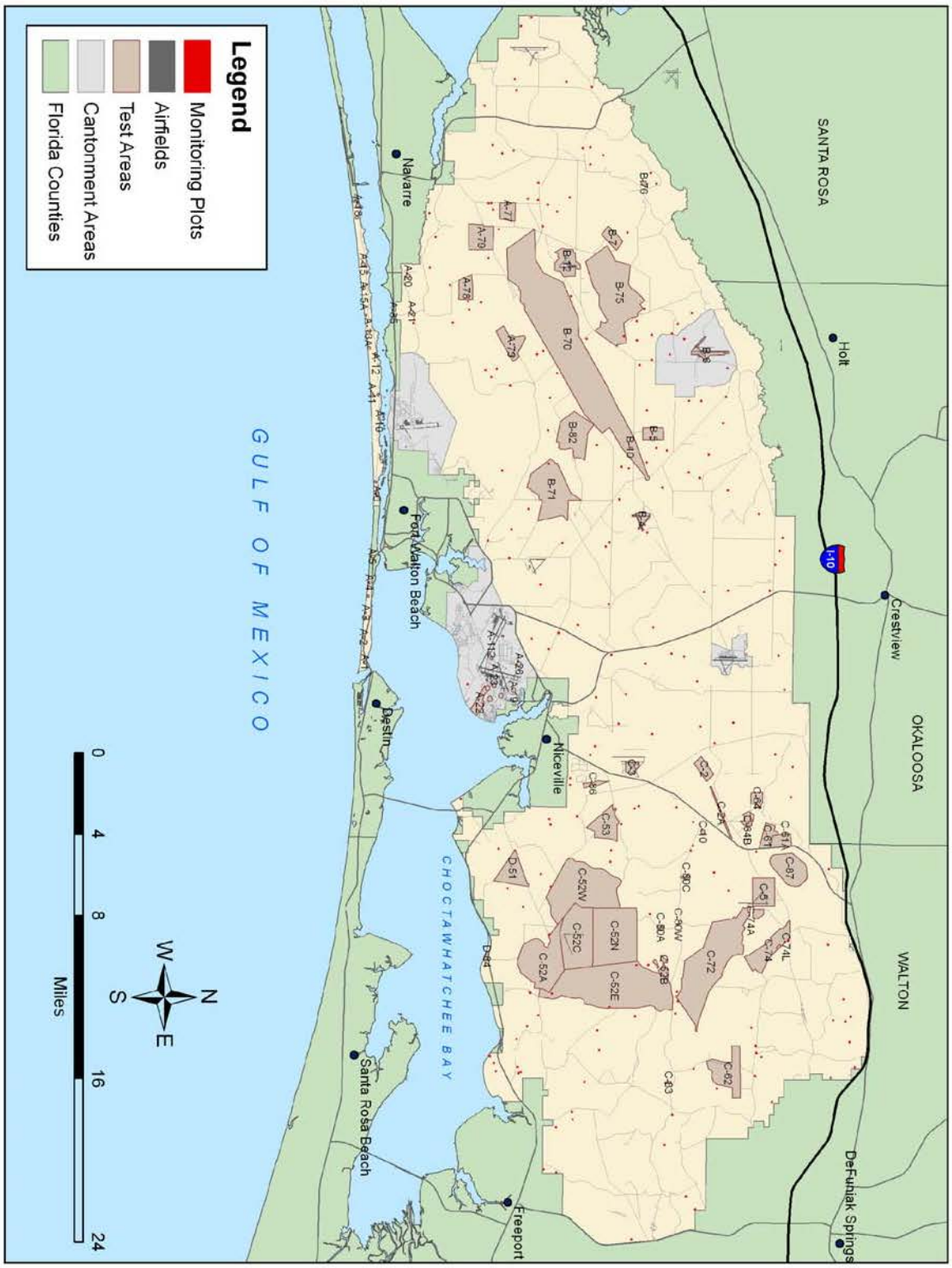

Figure 1. Monitoring Plot Locations on Eglin

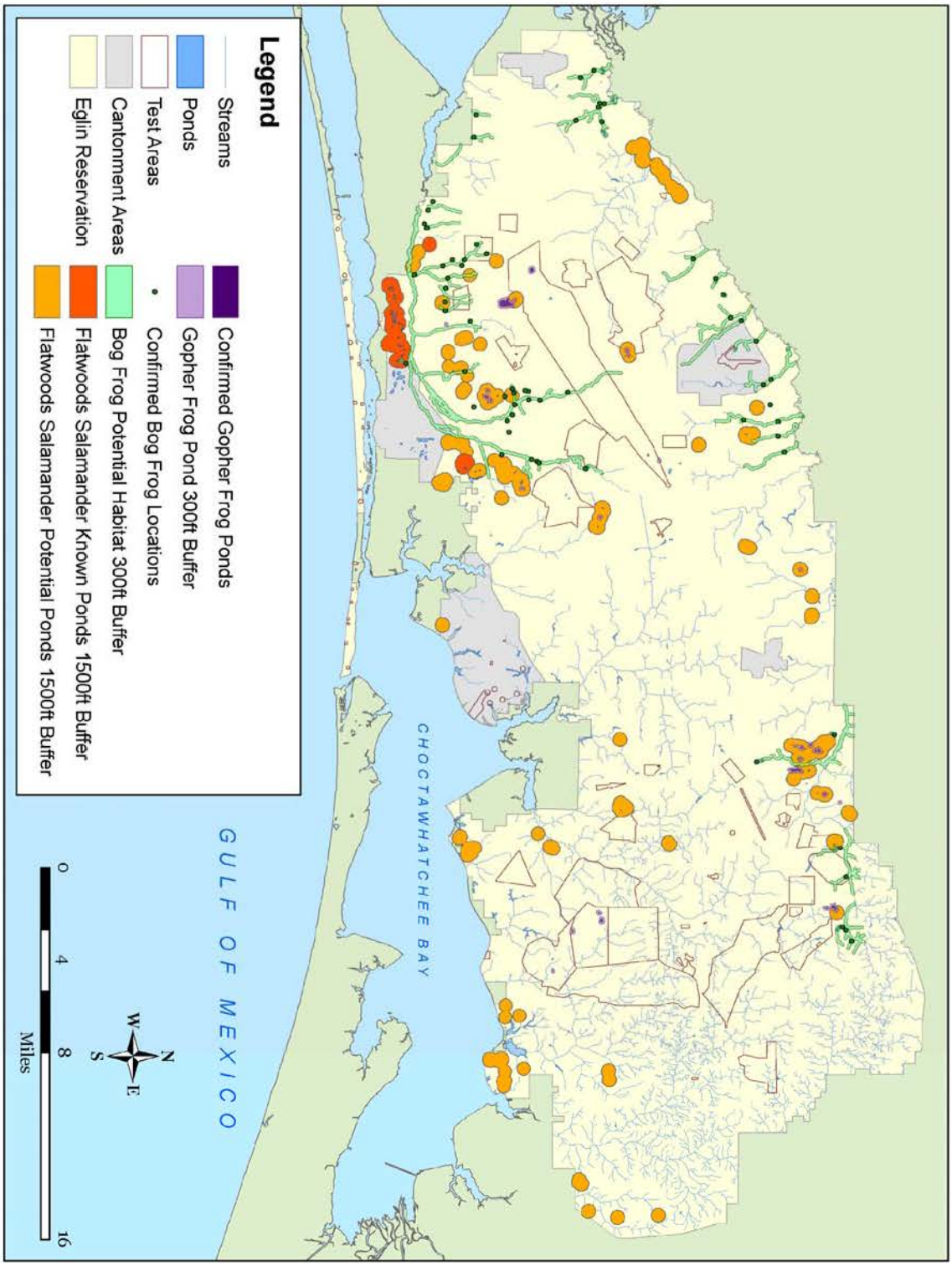

Figure 2. Amphibian Map

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Appendix D-3

USFWS Concurrence Letter

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IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Field Office
1601 Balboa Avenue
Panama City, FL 32405-3721

Tel: (850) 769-0552
Fax: (850) 763-2177

September 4, 2007

Mr. Stephen M. Seiber
Chief, Eglin Natural Resources
501 De Leon Street, Suite 101
Eglin AFB, FL 32542-5133

Re: FWS No. 4-P-07-036
Long-Term Vegetation Control

Dear Mr. Seiber:

Thank you for the amendment to the biological assessment submitted to our office on April 6, 2007. The amendment was received on July 31, 2007. The amendment addressed the comments from the U.S. Fish and Wildlife Service (Service) on the proposed action. These comments reflected our review of the biological assessment on the proposed action after discussion with you and your staff. The purpose of the comments was to assist Eglin Air Force Base (Eglin AFB) to ensure that the proposed action complied with the requirements of Section 7 of the Endangered Species Act (ESA). This Biological Assessment addressed potential impacts to the bald eagle, Eastern indigo snake, flatwoods salamander, Gulf sturgeon, Gulf sturgeon critical habitat, Okaloosa darter and red-cockaded woodpecker associated with long-term vegetation control on Eglin AFB, Florida.

Your Proposed Action involves the approval for, and use of, various herbicides on Eglin AFB for land test area maintenance, line of site maintenance, helicopter landing zone maintenance, red-cockaded woodpecker (RCW) and native ecosystem restoration, invasive non-native plant species control, and native plant nursery development. The Air Force proposes to use herbicides on Eglin AFB's test areas and interstitial areas to control vegetation including, but not limited to, live oak, laurel oak, turkey oak, and waxy shrubs such as gallberry, greenbrier, and wax myrtle.

This action is proposed to fulfill Eglin AFB's need to maintain many of the Eglin land test areas as grassy habitat in order to allow unimpeded observations and lines-of-sight for evaluating munitions tests. The approval of additional herbicides would allow application in all seasons and would allow longleaf restoration in flatwoods and other habitats. The Proposed Action is also expected to improve current RCW and ecosystem restoration efforts and reduce sedimentation impacts to the Okaloosa darter.

Eglin's Natural Resources section has determined that the Proposed Action as amended is not likely to adversely affect the bald eagle, Eastern indigo snake, flatwoods salamander, Gulf sturgeon, Okaloosa darter, red-cockaded woodpecker and not likely to adversely modify Gulf sturgeon critical habitat. Avoidance and minimization measures would serve to eliminate potential impacts from long-term vegetation control activities.

The Service concurs with Eglin AFB's determination that the Proposed Action as amended is not likely to adversely affect the bald eagle, Eastern indigo snake, flatwoods salamander, Gulf sturgeon, Okaloosa darter, red-cockaded woodpecker and not likely to adversely modify Gulf sturgeon critical habitat with strict adherence to the proposed avoidance and minimization measures.

We look forward to working with you further in support of the natural resources of Eglin. If you have any questions concerning this matter, please contact Jon Hemming, Ph.D. of this office at extension 238 for additional information.

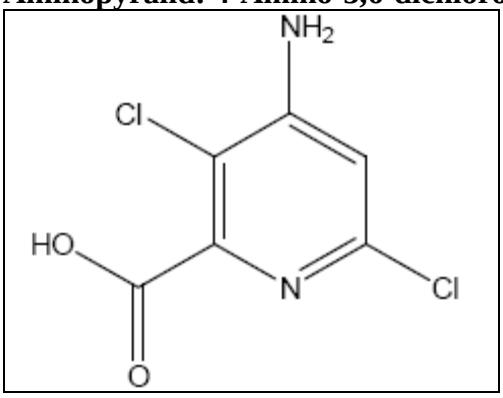
Sincerely yours,

Janet Mizzi
Deputy Field Supervisor

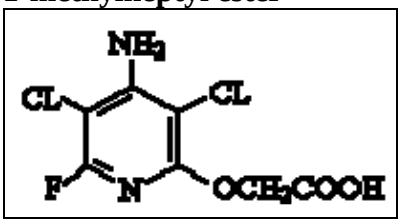
APPENDIX E

CHEMICAL STRUCTURES OF HERBICIDES

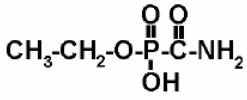
Aminopyralid: 4-Amino-3,6-dichloropyridine-2-carboxylic acid



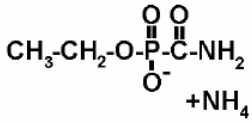
Fluroxypyr: 1-Methylheptyl ((4-amino-3,5-dichloro-6-fluoro-2-pyridinyl)oxy)acetic acid, 1-methylheptyl ester



Fosamine: ethyl hydrogen (aminocarbonyl) phosphonate

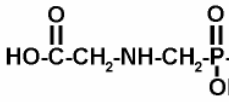


Fosamine acid

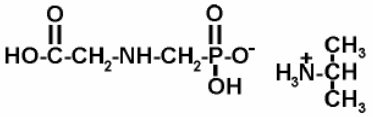


Fosamine ammonium salt

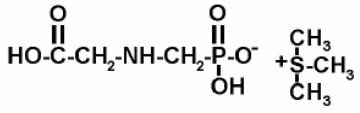
Glyphosate: N-(phosphonomethyl) glycine



Glyphosate acid

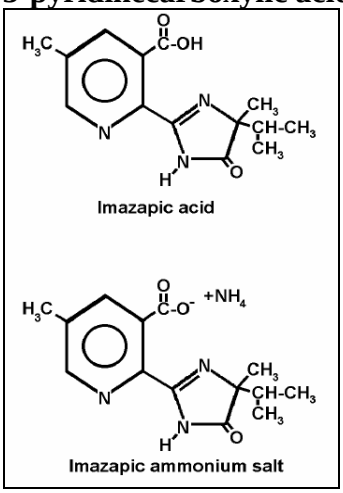


Glyphosate isopropylamine salt

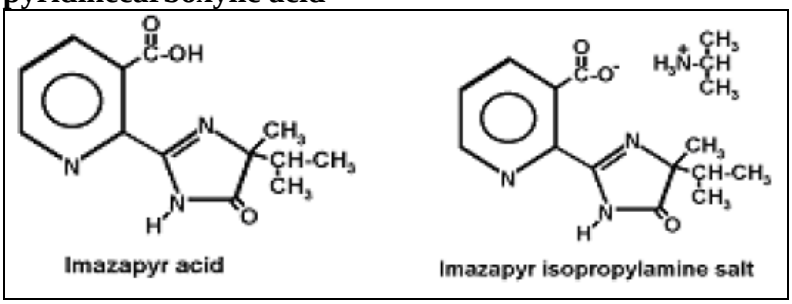


Glyphosate trimethylsulfonium salt

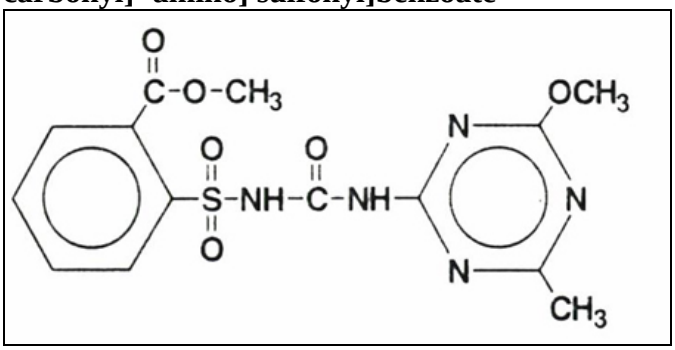
Imazapic: (±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid



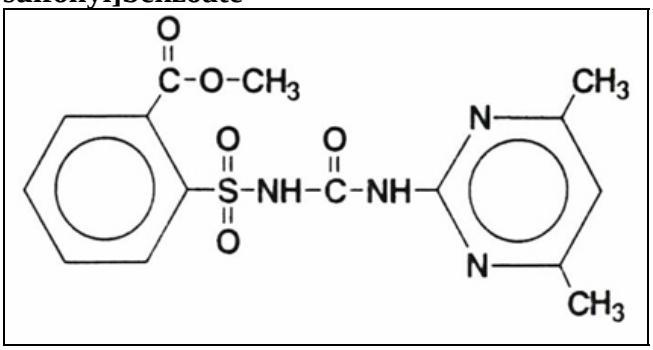
Imazapyr: (+)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid



Metsulfuron methyl: Methyl-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2- yl)amino] carbonyl]=amino] sulfonyl]benzoate



Sulfometuron methyl: Methyl 2-[[[[(4,6-dimethyl-2-pyrimidinyl) amino]-carbonyl]amino] sulfonyl]benzoate



**Images obtained from The Nature Conservancy Herbicide Handbook and http://www.bugwood.org/.

APPENDIX F

FLORIDA DIVISION OF FORESTRY SILVICULTURE BEST MANAGEMENT PRACTICES HANDBOOK

(ONLINE AT: http://www.fl-dof.com/forest_management/bmp/page_1.html)

Florida Division Of FORESTRY

Foreword

Silviculture Best Management Practices

DOF Home Send Email DOF Hydrology

Introduction

This manual establishes the Best Management Practices (BMPs) for silviculture operations in Florida. These practices are designed as the minimum standards necessary for protecting and maintaining the State's water quality as well as certain wildlife habitat values, during forestry activities. As such, they represent a balance between overall natural resource protection and forest resource use.

In addition, these practices were developed specifically for silviculture and are intended to be applied on all such operations. However, they are not intended for use during tree removal or land clearing operations associated with development or other activities that have non-forestry objectives.

Best Management Practices for Silviculture in Florida were first established in the mid 1970's in response to the Federal Clean Water Act of 1972. Those original BMPs were designed exclusively to protect Florida's streams and lakes from potential sources of pollution associated with forestry activities.

In 1992, Agriculture Commissioner Bob Crawford established a BMP Technical Advisory Committee which included representatives from state and federal government, university, forest industry and environmental groups. This committee was directed to review the existing BMP Manual and revise the practices where necessary to reflect the scientific, social and economic changes that have taken place since the original BMP development.

With this revision, some of the original practices have been retained as part of the continuing strategy to achieve water quality goals. However, many of these practices have been expanded to address additional water resource features such as sinkholes, smaller lakes, canals and wetlands. In addition, general ecological considerations and wildlife habitat values have been included in specific BMP objectives, resulting in expanded versions of original BMP concepts such as Special Management Zones, as well as new ones such as BMPs for wetlands.

Although many of the relationships between silviculture activities and impacts to natural resources have been well quantified, many others have not. Consequently, as significant new information has become available, it has been incorporated into the practices in this Manual. To that end, the BMP Technical Advisory Committee will continue to meet biennially, in concert with BMP compliance monitoring, to evaluate the status and progress of BMP implementation and effectiveness.

Because of the extensive revisions to this document, some of the technical terms used in the Manual have specific definitions that may differ from conventional or traditional meanings. The reader is strongly advised to review the Glossary of terms prior to reading the Manual or implementing the practices.

http://www.fl-dof.com/forest_management/bmp/page_1.html 9/24/2007

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